Mental Illness

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Hospitalization, Outpatient Service Use, and Perceived Healthcare Need as Mediators of Climate Change Anxiety and Suicide Ideation Among Middle-Aged and Older Adults: A Population-Based Path Analysis

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ABSTRACT

Background: Suicide theories imply that climate anxiety is indirectly associated with lower suicidal ideation through three mediators: perceived healthcare need, outpatient service use, and hospitalization. However, no study has assessed this relationship. An evaluation of this association in middle-aged and older adults may provide implications for climate change adaptation.

Aim: We are aimed at ascertaining whether the relationship between climate anxiety and suicidal ideation is mediated by perceived healthcare need, outpatient service use, and hospitalization.

Methods: A cross-sectional design was adopted, and the participants were noninstitutionalized middle-aged and older Ghanaians aged 50 years or above. Multistage sampling was used to select a nationally representative sample ($N = 4147$). A serial path model (via structural equation modelling) was tested to assess the relationship, and the effect sizes were stratified by age and chronic disease status to maximize robustness.

Results: Climate anxiety was positively associated with perceived healthcare need ($\beta = 0.18$; $t = 11.591$; $p < 0.001$), hospitalization ($\beta = 0.12$; $t = 9.906$; $p < 0.001$), and suicidal ideation ($\beta = 0.18$; $t = 12.074$; $p < 0.001$). There was a net negative association between climate anxiety and suicidal ideation through the three mediators. Climate anxiety is more negatively associated with suicidal ideation through the three mediators in the younger age group and among those with at least one chronic disease.

Anxiety: Climate anxiety is negatively associated with suicidal ideation through hospitalization, especially in the younger age group and those with chronic diseases. Enhancing access to inpatient care may protect against suicidality and could be an imperative for climate change adaptation.

1 | Introduction

Climate change, one of the biggest challenges of the 21st century, is both an economic and a public health problem. The increasing prevalence of unsettling events such as heatwaves, hurricanes, wildfires, and flooding is the consequence of climate change [1, 2]. Eco-anxiety is not only a psychological response to extreme ecological events or disasters, but also the repercussion of the individuals' experience of or exposure to these events [3, 4]. Eco-anxiety is the individual's fear that the ecological basis of life is about to collapse [4]. It is a broader construct of a person's physical, psychological, and emotional reaction to extreme natural and man-made environmental disasters, with climate change anxiety being a specific type of this construct [4, 5]. Earthquakes, landslides, and volcanoes are a few examples of ecological disasters that cause eco-anxiety.

Climate change anxiety, or climate anxiety, is the individual's feeling of worry, dread, inner turmoil, or distress about anthropogenic climate change [6]. It is a specific type of anxiety attributable to one's exposure to extreme climate change events, such as extreme heatwaves, flooding, and tsunamis [4, 6]. Whereas eco-anxiety encompasses fear of all environmental problems, climate anxiety is exclusively the fear of disorientating extreme climate change events. Mild or moderate climate anxiety may foster concern for environmental problems and encourage proenvironmental action [4]. Severe climate anxiety, however, is a risk factor for various morbidities and mortality [4, 6, 7]. Climate anxiety is expected to increase healthcare demand and utilization, heightening the burden of healthcare worldwide [8]. Yet, the evidence on the impact of climate anxiety on perceived healthcare need and utilization is largely anecdotal, and no study has examined the association of climate anxiety with specific types of healthcare utilization, such as hospitalization and outpatient service use.

Research [9, 10] and life experiences (e.g., injuries from extreme climate change events) suggest that climate anxiety can be associated with suicidal ideation, which is defined as the individual's thoughts or imagination of self-directed suicide [11]. An individual who lost a marriage partner or limb during a hurricane, for example, may develop suicidal thoughts linked to climate anxiety. Research suggests that the loss of personal resources and social ties (e.g., a spouse) during climate change disasters can influence climate anxiety [12]. Such losses can also lead to intense psychological pain, which is a potential cause of suicidal ideation [13]. Studies [14, 15] suggest that large-scale or global crises (e.g., climate change and the outbreak of coronavirus disease 2019) can increase the risk of psychiatric morbidity. Climate change and its extreme events are globally experienced and are, therefore, expected to inflict pain. Notably, older adults are the most vulnerable to climate change [16, 17], have limited social support, and are often socially isolated [18]. If so, the loss of resources and a spouse in older age during a climate-related disaster would make an older adult more vulnerable to suicide. This and other losses are a basis of the association of climate anxiety with suicidal ideation, since any exposure to climate change events can cause climate anxiety [4, 19].

Additionally, social isolation is associated with a higher risk of suicidal ideation [20]. Researchers have also observed that people living in low- and middle-income countries are among those most vulnerable to climate change [21]. Hence, the likelihood that climate anxiety will be associated with suicidal ideation may be higher in middle-aged and older adults in an African context. Yet, no study has assessed this relationship.

An evaluation of the foregoing relationship and the association of climate anxiety with three mediators (i.e., perceived healthcare need, outpatient service use, and hospitalization) is necessary. This assessment can signal the extent to which middle-aged and older adults may demand and utilize healthcare, enabling stakeholders to plan against the healthcare needs of older adults in a world of rapid environmental change and population aging. Yet, more novel is an analysis of whether climate anxiety is indirectly associated with suicidal ideation through the three mediators. According to the Interpersonal Theory of Suicide (IPTS) [13, 22] and the three-step theory (3ST) [13], individuals' engagement with healthcare can protect against suicidal ideation. Engaging with health professionals can provide palliative support that protects against suicidal risks associated with climate anxiety.

Given the increasing prevalence of suicide among older adults globally [23], evidence on whether climate anxiety is associated with lower suicidal ideation through the three mediators is needed. Suicidal ideation has been framed as a mental health risk or a psychiatric emergency requiring psychiatric care [24]. Yet, psychiatric care alone may not be sufficient for managing suicidal ideation during the climate crisis. From the viewpoint of the foregoing theories, we foresee the possibility of general healthcare utilization (i.e., hospitalization and outpatient service use) playing a role in the management of suicidal ideation. We expect engagement with any group of health professionals through hospitalization and outpatient service use to buffer suicidality. Hence, this study examined the (1) direct association of climate anxiety with suicidal ideation, and (2) indirect association of climate anxiety with suicidal ideation through the three mediators.

Including perceived healthcare need as a mediator in the current analysis maximizes novelty. The place of this variable in a path model provides evidence on whether climate anxiety is associated with individuals' need for healthcare. The literature assumes that people with climate anxiety would need healthcare [4], but no study has tested the link between climate anxiety and perceived healthcare need. Since demand for healthcare is an outcome of perceived healthcare need, the path model tested in this study would provide evidence for validating or refuting the above assumption, thereby guiding future interventions. Moreover, the three variables make the serial path model more inclusive and complete, since it determines whether people should use inpatient or outpatient care. Outpatient care and hospitalization are different pathways to meeting healthcare needs, although they can be related. If both are related to climate anxiety and mediate climate anxiety and suicidal ideation, this may have implications for healthcare planning and expenditure. Testing their mediating roles would unfold such implications and offer insights into hospitalization and outpatient service use as potential protective factors of suicidal ideation.

This study is the first to test a serial path model linking climate anxiety to the three mediators and suicidal ideation. Testing this model reduces the Type 1 error associated with examining a complex nexus in parts. The path model is stratified by age

and chronic disease status, since individual relationships may depend on age and chronic disease status. Being older or living with a chronic disease increases the likelihood of the above direct and indirect relationships, and stratification analysis would broaden the scope of the practical implications. Additionally, the quality and depth of care received by these groups may be different. People with chronic diseases, for example, usually receive more empathetic and patient-centric care through interprofessional collaboration [25]. Since healthcare demand and utilization associated with climate change are highest in middle-aged and older adults [16, 26], focusing on this population would provide evidence for healthcare planning in response to population aging.

2 | Theoretical Framework

The increasing prevalence of provocative climate change events implies a positive association between climate anxiety and suicidal ideation. The IPTS lays the conceptual foundation of this relationship. Proposed by Joiner [22], the IPTS argues that the simultaneous presence of *thwarted belongingness* (TB) and *perceived burdensomeness* (PB) causes suicidal desire. TB occurs when the individual's fundamental need to belong is not met [13], and persons with TB often feel neglected and disconnected from familial and peripheral social ties. PB occurs when people see themselves as a burden on others, including close friends and family members [13]. PB originates from a person's disadvantaged situation (e.g., being disabled) and excessive dependence on others for a normal life. It occurs when people lack control over their lives and need to depend on others for survival or a normal life.

TB and PB must occur simultaneously with the *acquired ability* for a suicidal desire to grow into a lethal suicide attempt [22, 27]. The acquired ability is not any good ability with which the individual is born, but is the ability to attempt suicide [22]. It is molded by provocative and unsettling life experiences that weaken pain sensitivity and the fear of death. TB and PB are not sufficient for a suicide attempt because people are born with pain sensitivity and a fear of death, which prevents them from self-harm even in difficult life situations [13]. Yet, a person's constant exposure to traumatic life events weakens the fear of death and pain sensitivity, bringing about the acquired ability for suicide and its growth. As the individual's acquired ability grows, their suicidal desire flourishes, leading to a lethal suicide attempt and suicide. Notable is the continuum from a suicidal desire through a suicide attempt to action (i.e., actual suicide), which depends on the acquired ability.

A key postulate of the IPTS is that "connectedness" is a key determinant of suicide desire and its progression from a suicidal thought to a suicide [13, 22]. Connectedness refers to a person's connection to friends, familial ties, workmates, and service providers. A strong sense of connectedness impresses upon individuals to cherish and protect their lives despite their painful experiences. This and other arguments of the IPTS have been strongly supported by research [13]. A systematic review of 58 empirical studies has found support for the IPTS [28], and another literature review found strong support for the various tenets of IPTS in adolescents [29].

The 3ST rivals but conceptually overlaps with the IPTS. Proposed by Klonsky and May [30], the 3ST provides a three-step delineation of the motivators of suicide and how suicidal desire progresses. Step 1 of the theory argues that suicidal desire is caused by a combination of pain and hopelessness. When people experience pain and grief due to their exposure to provocative life events, they feel they are being punished by life. Step 2 suggests suicidal ideation escalates or grows when pain exceeds or overwhelms connectedness. Hopefulness and a positive outlook on life emanate from one's connectedness to social networks. Step 3 posits that suicidal ideation grows into a suicide attempt and action when the individual acquires the ability to die by suicide. The acquired ability is influenced by various factors, such as knowledge of and access to lethal means.

The 3ST and IPTS conceptually overlap in two ways. First, both theories recognize that connectedness plays a crucial role in the occurrence and growth of suicidal desire [13]. Secondly, the two theories agree that the acquired ability catalyzes the progression of suicidal desire to suicide. Yet, the 3ST is unique in its recognition of pain and hopelessness as the primary motivators of suicidal desire. IPTS, on the other hand, recognizes PB and TB as the primary motivators of suicidal desire. 3ST frames the acquired ability differently; it emphasizes dispositional and practical factors as drivers of the acquired ability. An example of these factors is access to health services that alleviate pain and suffering. Like the IPTS, the 3ST has been substantially supported by research [31]. The above theoretical deductions are the basis of the direct relationships of the nexus shown in Figure 1.

2.1 | Direct Relationships of the Nexus

The pivot of our conceptual framework (see Figure 1) is the potential association between climate anxiety and suicidal ideation (Hypothesis 1). This relationship is more probable in situations where individuals are exposed to provocative climate change events. Since climate change is worsening, people's exposure to these events is expected to grow. Extreme climate change events are associated with health problems (e.g., migraines and respiratory disorders) and disabilities, especially in older adults [16, 32], that inflict pain, hopelessness, TB, and PB. The growth of pain from these events would, therefore, increase the ability to commit suicide. To illustrate, heatwaves can be associated with discomfort, which can worsen and grow into emotional pain. Heatwaves can also result in chronic headaches and migraines [32], painful conditions capable of provoking suicidal ideation. Climate anxiety is an outcome of exposure to heatwaves and other extreme climate change events [4, 6, 7]; hence, physical and emotional pain from heatwaves and other extreme events may coexist with or be proportional to climate anxiety. This being so, climate anxiety would be associated with suicidal ideation.

Compared with younger people, older adults possess a higher level of psychological capital (i.e., resilience, optimism, and self-efficacy) that protects against climate anxiety and suicide ideation [19], but this capital does not necessarily override the impact of climate anxiety on suicide ideation. Corroborating our first hypothesis is research supporting the association between anxiety disorders and suicidal ideation [9, 10, 33]. A

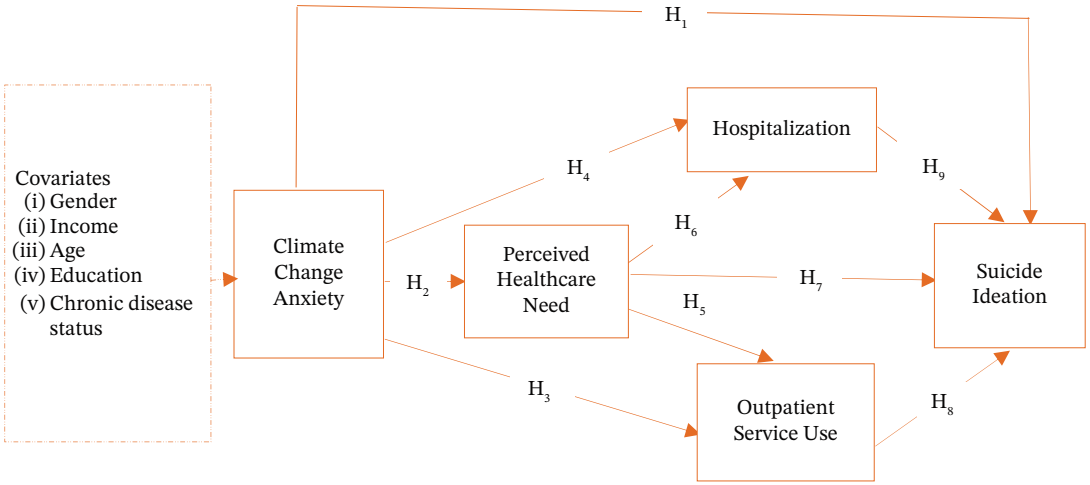

FIGURE 1 | Association of climate change anxiety, perceived healthcare need, outpatient service use, and hospitalization and suicide ideation. *Note:* Hypothesis 1—the association of climate anxiety with suicidal ideation, Hypothesis 2—the association of climate anxiety with perceived healthcare need, Hypothesis 3—the association of climate anxiety with outpatient service use, Hypothesis 4—the association of climate anxiety with hospitalization, Hypothesis 5—the association of perceived healthcare need and outpatient service use, Hypothesis 6—the association of perceived healthcare need and hospitalization, Hypothesis 7—association of perceived healthcare need with suicidal ideation, Hypothesis 8—the association of outpatient service use with suicidal ideation, and Hypothesis 9—the association of hospitalization with suicidal ideation.

cross-sectional study in Kenya found a positive association between climate change worry (which is closely related to climate anxiety) and suicidal ideation [33]. Another cross-sectional study in the United States found a positive association between climate change stress and suicidal ideation [10]. In Germany, a positive association between climate change distress and suicidal ideation was found [9]. Notably, these studies focused on adolescents.

A person's exposure to extreme climate change events, which is an antecedent for climate anxiety, makes them susceptible to illnesses requiring outpatient service use and hospitalization [4, 6]. Heatwaves and dust tsunamis, for example, are associated with headaches, migraines, respiratory illnesses, and fevers [32], which usually require hospitalization or healthcare utilization. Hospitalization and healthcare utilization are outcomes of perceived healthcare need. Thus, perceived healthcare need may be associated with climate anxiety linked to climate change–related illnesses (Hypothesis 2). This hypothesis is supported by researchers who have observed that climate anxiety is increasing healthcare demand globally [4, 6, 34, 35]. Researchers [4, 6, 15, 35, 36] have also acknowledged (but not evaluated) the association of climate anxiety with outpatient service use (Hypothesis 3) and hospitalization (Hypothesis 4). Perceived healthcare need would translate into the use of health services, which is the basis of the association between perceived healthcare need and outpatient service use (Hypothesis 5) as well as hospitalization (Hypothesis 6).

The theoretical basis of the association of climate anxiety with perceived healthcare need, outpatient service use, and hospitalization is the IPTS's argument that suicidal desire is partly caused by TB [13, 22], a perspective implying the need for everyone to satisfy the desire to belong. A sense of belonging comes from one's interaction with peripheral and familial social connections, including health professionals. Individuals who experience traumatic events have a strong desire to be connected to palliative social networks where empathy and solutions to illness and disability may be accessed. This desire may be stronger among traumatized but neglected or isolated persons, and prompt connection of such individuals to health professionals through hospitalization or ambulatory care can be the difference between life and death. Whether climate anxiety would be associated with hospitalization would depend on its level and the intensity of the events causing it. Climate anxiety from more traumatic events (e.g., losing a limb during a hurricane) is more likely to result in outpatient service use and hospitalization.

IPST and 3ST recognize the role of connectedness in suicidality and the progression of suicidal desire to suicide [13]. Connectedness with social networks and healthcare providers may protect against suicidal thoughts and terminate the progression of suicidal desire into a suicidal action [18]. Health professionals usually provide empathetic and compassionate care that fosters a sense of belonging and connectedness. Patient-centered care is holistic as it is tailored to meet patients' emotional, physical, and spiritual needs [37]. The compassion and empathy shown by health professionals can buffer or alleviate pain, hopelessness, PB, and TB from provocative life events and health problems such as climate anxiety. Patient-centered care may be constrained in low-resource settings such as Ghana, but its attributes can offer empathy and palliative support [37, 38]. This perspective underscores a negative association of suicidal ideation with perceived healthcare need (Hypothesis 7), outpatient service use (Hypothesis 8), and hospitalization (Hypothesis 9). Individuals who need healthcare and satisfy this need through outpatient service use and hospitalization would report lower scores of suicidal ideation.

2.2 | Indirect Relationships

Figure 1 shows five indirect relationships between climate anxiety and suicidal ideation that are founded on the direct relationships. Three of the indirect relationships are the associations of climate anxiety with suicidal ideation through perceived healthcare need, outpatient service use, and hospitalization. These relationships imply that perceived healthcare need, outpatient service use, and hospitalization transmit part or all of the variance in climate anxiety on suicidal ideation [39]. The two longest indirect paths are the indirect relationships of climate anxiety with suicidal ideation through two paths: (1) perceived healthcare need and outpatient service use, and (2) perceived healthcare need and hospitalization. Apart from these indirect relationships, we tested the "net indirect effect" of the model (Figure 1), which is the "balance" of the standardized regression coefficients from the five indirect paths [40]. Thus, the "balance" is the sum of all individual indirect regression coefficients [41]. A positive net indirect coefficient indicates that all the mediators transmit a positive variance (influence) on the outcome variable. Our estimation of the indirect relationships and the net indirect regression coefficient was a way to assess perceived healthcare need, outpatient service use, and hospitalization as protective mediators against suicidal ideation.

2.3. Confounding

As previous research suggests [4, 6, 42, 43], climate anxiety and suicide ideation may depend on personal factors, such as age, income, and chronic disease status. Hence, such personal factors can confound the hypothesized model. We, therefore, treat relevant personal factors (i.e., age, gender, education, income, chronic disease status, and self-reported health) as potential confounders of the hypothesized relationships depicted in Figure 1, the conceptual model.

3 | Methods

3.1 | Design

This study adopted a cross-sectional design, tested the path model with the whole sample, and stratified the coefficients by age and chronic disease status.

3.2 | Study Context and Participants

This study utilized data from the second wave of the Climate Psychology in Ageing Study [19], a population-based study conducted in Ghana, West Africa. Ghana's 16 regions are in three climatic regions: the rainforest, the northern, and the coastal areas. The participants were noninstitutionalized middle-aged and older adults aged 50 years or above living in the three climatic regions.

3.3 | Sampling and Sample Size

The multistage sampling strategy was utilized to select the participants. Eight cities were systematically selected from the three climatic regions. Takoradi and Tema were in the coastal area; Bolga and Damango were in the northern area, and Abetifi, Konongo, Hohoe, and Sunyani were in the rainforest area. Each city or town was divided into four cardinal blocks from which participants were selected randomly. The inclusion criteria were (1) being a permanent resident of the cities, (2) being aged 50 years or over, (3) not living with a neurodegenerative disorder (e.g., dementia), and (4) willingness to participate in the study. People with neurodegenerative disorders have severe memory limitations, so their inclusion in the study would have biased the responses.

The minimum sample size required for testing the path model was calculated with Soper's sample size calculator for multiple regression analysis [44], which has been reliably used in previous research [19, 45]. A minimum sample size of 69 was calculated based on recommended statistics (i.e., effect size = 0.30; power = 0.80; $\alpha = 0.05$, and maximum number of predictors = 10). We assumed an attribution rate of 10% [45], leading to a minimum sample size of 76. Yet, we selected as many participants as possible to maximize the statistical power. A total of 4147 individuals were selected; 8% ($N = 332$) were from the north, 35% ($N = 1469$) from the coastal area, and 57% ($N = 2346$) from the rainforest area.

3.4 | Study Ethics and Data Collection

The participants provided written informed consent after reviewing and signing the participant information sheet. The respondents participated in the study voluntarily, and no incentives were given. The study received ethical review and clearance from the School of Health and Social Care of the University of Essex (Reference TH2425-0021), following local ethics clearance from the Kwame Nkrumah University of Science and Technology at the College of Social Sciences and Humanities (Reference HuSSREC/AP/VOL. 3). The data were collected from July 15 to August 30, 2025. At least four trained field assistants, supervised by one of the researchers, administered questionnaires at locations convenient to the participants.

3.5 | Variables and Measurement

3.5.1 | Climate Anxiety

This was measured with the 13-item standardized scale adopted in whole from the literature [5]. The scale's seven descriptive anchors and their corresponding codes *are not at all (1), practically never (2), seldom (3), sometimes (4), most of the time (5), almost always (6),* and *always (7)*. Some items of the scale are "I find myself crying because of climate change" and "I write down my thoughts about climate change and analyze them." The scale yielded a Cronbach's alpha $\alpha = 0.96$, which exceeds the minimum threshold of 0.7 [5]. Thus, the scale was highly internally consistent. The composite scores of the scale obtained through item summation ranged from 13 to 91, with larger scores indicating severe climate anxiety. Table A1 shows items used to measure climate anxiety.

3.5.2 | Suicidal Ideation

This was measured with a standardized 10-item scale adopted wholly with its five descriptive anchors (i.e., *1—strongly disagree, 2—disagree, 3—somewhat agree, 4—agree,* and *5—strongly agree*) from the literature [46]. Sampled items of the scale are "If things get worse, I will end my life" and "There is nothing further I can do to help." Three of the items were positively worded and were, therefore, reverse-coded. The Cronbach's alpha coefficient of the scale was 0.91, which signified high internal consistency. The composite score of the scale ranged from 10 to 50, with larger scores indicating higher suicidal ideation. Table A2 shows items used to measure suicidal ideation.

3.5.3 | Healthcare Utilization Measures

Hospitalization was operationally defined as at least one overnight stay in a healthcare facility while receiving any health service. Outpatient service use was defined as utilizing health services without an overnight stay in a health facility. Hospitalization and outpatient service use were measured by asking the participants to report the number of times they were hospitalized or used outpatient health services over the past year (i.e., 12 months). Those who were not hospitalized or did not use any outpatient service were asked to report 0. To improve accuracy, reported healthcare utilization was verified using health facility records. We used the participants' health insurance numbers or invoice codes for verification, ensuring that the process was anonymized. We standardized our verification by ensuring that each hospital visit was recorded in the hospital's health information systems and verbally confirmed by a health professional working in the hospital. All participants were successfully verified. Perceived healthcare need was measured by asking the participants to indicate the extent to which they needed any type of health service over the past 12 months. The participants' rating was based on a scale of 1–10, with 10 signifying the highest perceived healthcare need. This measurement method was employed because there was no validated scale for measuring perceived healthcare need. Yet, its use followed previous studies that used a single item to measure health outcomes on a Likert scale [47]. The wide range of the scale (i.e., 1–10) allowed us to treat the variable as a continuous variable.

3.5.4 | Demographic Variables and Covariates

Age was measured as the individual's chronological age, whereas gender (men–1, and women–2), education, income in Ghana cedis (i.e., <2000–1, and $\geq 2{,}000$–2), chronic disease status, and self-reported health (poor–1, and good–2) were measured as categorical variables. Chronic disease status was measured by asking the participants to report the number of clinically diagnosed chronic diseases they had. The responses were coded into two groups: (1) individuals who had no chronic disease, coded as 1, and (2) individuals who had one or more chronic diseases, coded as 2. Self-reported health was measured by asking the participants to report whether their health was "poor" (Coded 1) or "good" (Coded 2). Education was measured as the participant's years of formal education.

3.6 | Pilot Study and Instrumentation

A structured questionnaire was used to collect the data after it was piloted on 350 participants randomly selected from the 4147 eligible participants. The pilot study was carried out to identify any potential errors in the questionnaire and assess the scales' internal consistency and time-stability of the measures. We selected 40–45 participants from each city or town and conducted the pilot study between June 4 and 30, 2025. The participants reported no issues in the pilot study, and the Cronbach's alpha coefficients of climate anxiety and suicide ideation were 0.91 and 0.92, respectively. Consistency of the measures was confirmed with a strong Pearson's correlation coefficient between data from the pilot study and the survey; the correlations ranged between 0.76 and 0.89.

Recommended techniques for avoiding or minimizing response bias were followed [48]. Firstly, we coherently described the instructions for completing the survey in a preamble. The questionnaire was organized into distinctive blocks, with each block measuring specific variables or a set of variables. Each block had survey-completion instructions. Secondly, we used standardized scales and verified the data for accuracy where possible.

3.7 | Statistical Analyses

We analyzed the data with SPSS and AMOS Version 30. The data were analyzed at three stages. At Stage 1, we summarized the data with descriptive statistics to identify missing observations. Less than 2% of missing data were found across only three indicators, and the missing completely at random test allowed us to utilize *multiple imputation* to deal with the missing data [49]. At Stage 2, relevant statistical assumptions regarding structural equation modelling were assessed. The assumptions are linearity of the relationships, multivariate normal distribution of the data, and multicollinearity among the independent variables. Multivariate normal distribution was confirmed with an overall estimator ranging between 1.1 and 2.2 in the adjusted models [50]. The absence of multicollinearity was confirmed with tolerance values between 0.1 and 3.4 [19, 50]. Linearity of the relationships was assessed with *curve estimation* [19], a method used to evaluate whether the relationships could be expressed as a linear function. The results were significant at $p < 0.001$, which allowed us to use SEM to test the path model. Figure A1 and A2 show sampled graphs from curve estimation.

At Stage 3, two primary structural models were tested on the whole sample. The crude (baseline) model excluded the covariates, whereas the adjusted model (see Figure 2) included the covariates. We then tested the structural model on the two age groups and chronic disease statuses in the stratification analysis. Following previous research [19], the indirect coefficients (i.e., effect sizes) were computed with the "user-defined estimands" function by multiplying all weights on each path. The net indirect coefficients were computed by adding all the effects through the "user-defined estimands" function. The net coefficients represent the indirect effect of climate anxiety on suicidal ideation through the three mediators. All estimations were based on 5000 sampling iterations or bootstraps at a 95% confidence level. The statistical significance of the results was at a minimum of $p < 0.05$.

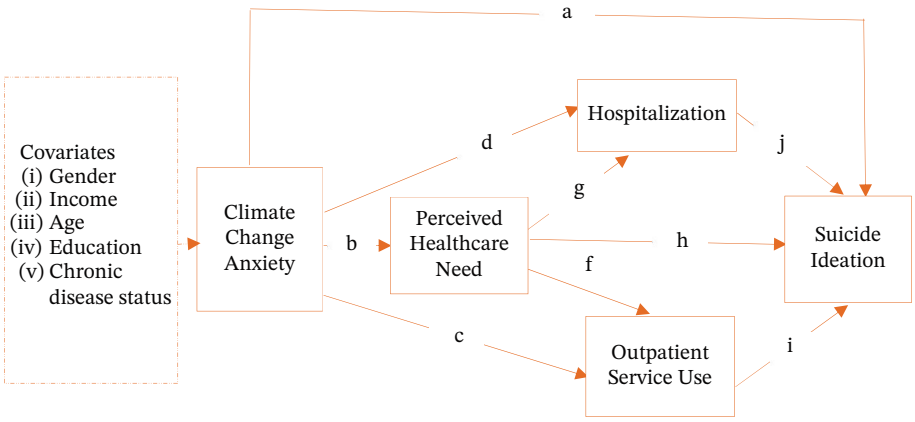

FIGURE 2 | The adjusted (structural) model. *Note:* Paths a–j represent the regression weights or path coefficients; the model included error terms on all dependent variables.

TABLE 1 | Summary statistics on variables included ($N = 4147$).

Variable	Group	*M* / *n*	SD/%	Min–max
Continuous variables				
Age (years)	—	60.45	8.64	50–98
Education (years)	—	17.21	6.02	11–29
Climate anxiety	—	35.44	16.93	13–91
Suicide ideation	—	24.31	10.64	10–50
Outpatient service use	—	4.54	3.29	0–9
Hospitalization	—	3.82	3.34	0–10
Perceived health service need	—	4.58	3.45	1–10
Categorical variables				
Gender	Men	2063	49.75	—
	Women	2059	50.25	—
Income (₵)	≤2000	2305	55.58	—
	>2000	1842	44.42	—
Chronic disease status	None	2474	59.7	—
	One or more	1673	40.3	—
Self-reported health	Poor	1007	24.28	—
	Good	3140	75.72	—
	Total	4147	100	—

Note: n–frequency; —, not applicable.
Abbreviations: %, percent; M, mean; SD, standard deviation.

4 | Results

Table 1 shows the summary statistics on all variables. The average age of the participants was 60 years (Mean = 60.45; SD = 8.64), and the average climate anxiety was 35 (Mean = 35.44; SD = 16.93; see Table 1). About 50% ($N = 2059$) of the participants were women, and 28% ($N = 1165$) had completed tertiary education. About 44% ($N = 1842$) of the participants earned a gross monthly income of more than Gh₵2,000.

Table 2 shows the direct regression coefficients from the primary models. The adjusted model suggests that climate anxiety was positively associated with suicide ideation ($\beta = 0.18$; $t = 12.074$; $p < 0.001$), perceived healthcare need ($\beta = 0.18$; $t = 11.591$; $p < 0.001$), and hospitalization ($\beta = 0.12$; $t = 9.906$; $p < 0.001$) but not outpatient service use ($\beta = 0.001$; $t = 0.070$; $p > 0.05$). This outcome suggests that higher climate anxiety was associated with higher suicide ideation, higher perceived healthcare need, and more frequent hospitalization. Perceived healthcare

TABLE 2 | Association of climate anxiety with perceived healthcare need, outpatient service use, hospitalization, and suicide ideation ($N = 4147$).

Dependent variable	Path	Independent variable	Coefficients		SE	Critical ratio
			B	**Beta (β)**		
		Baseline				
Perceived healthcare need	<---	Climate anxiety	0.036***	0.177***	0.003	11.591
Hospitalization	<---	Climate anxiety	0.023***	0.117***	0.002	9.906
Outpatient service use	<---	Climate anxiety	0.000	0.001	0.003	0.070
Outpatient service use	<---	Perceived healthcare need	0.444***	0.466***	0.013	33.373
Hospitalization	<---	Perceived healthcare need	0.613***	0.632***	0.011	53.483
Suicide ideation	<---	Perceived healthcare need	−1.074***	−0.348***	0.064	−16.819
Suicide ideation	<---	Hospitalization	−0.135*	−0.042*	0.062	−2.178
Suicide ideation	<---	Outpatient service use	0.480***	0.148***	0.053	9.013
Suicide ideation	<---	Climate anxiety	0.113***	0.180***	0.009	12.074
Climate anxiety	<---	Age (ref–70 or above)	−1.507**	−0.040**	0.569	−2.651
Climate anxiety	<---	CDS (ref–none)	−4.181***	−0.120***	0.527	−7.939
Climate anxiety	<---	Gender (ref–women)	0.623	0.018	0.517	1.207
Climate anxiety	<---	Education (ref–tertiary)	−0.742	−0.020	0.575	−1.291
Climate anxiety	<---	SRH (ref–none)	−6.343***	−0.160***	0.603	−10.528
Climate anxiety	<---	Income (ref–< ₵2000)	1.963***	0.057***	0.520	3.776
		Adjusted				
Perceived healthcare need	<---	Climate anxiety	0.036***	0.177***	0.003	11.591
Hospitalization	<---	Climate anxiety	0.023***	0.117***	0.002	9.906
Outpatient service use	<---	Climate anxiety	0.000	0.001	0.003	0.070
Outpatient service use	<---	Perceived healthcare need	0.444***	0.466***	0.013	33.373
Hospitalization	<---	Perceived healthcare need	0.613***	0.632***	0.011	53.483
Suicide ideation	<---	Perceived healthcare need	−1.074***	−0.348***	0.064	−16.819
Suicide ideation	<---	Hospitalization	−0.135*	−0.042*	0.062	−2.178
Suicide ideation	<---	Outpatient service use	0.480***	0.148***	0.053	9.013
Suicide ideation	<---	Climate anxiety	0.113***	0.180***	0.009	12.074
Covariates						
Climate anxiety	<---	Age (ref–70 or above)	−1.507**	−0.040**	0.569	−2.651
Climate anxiety	<---	CDS (ref–none)	−4.181***	−0.120***	0.527	−7.939
Climate anxiety	<---	Gender (ref–women)	0.623	0.018	0.517	1.207
Climate anxiety	<---	Education (years)	−0.742	−0.020	0.575	−1.291
Climate anxiety	<---	SRH (ref–none)	−6.343***	−0.160***	0.603	−10.528
Climate anxiety	<---	Income (ref–< ₵2000)	1.963***	0.057***	0.520	3.776

Note: β–standardized coefficient; *B*–unstandardized coefficient; SE–standard error of *B*.
Abbreviations: CDS, chronic disease status; SRH, self-reported health.
***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

need ($\beta = -0.348$; $t = -16.819$; $p < 0.001$) and hospitalization ($\beta = -0.042$; $t = -2.178$; $p < 0.05$) were negatively associated with suicide ideation, implying that perceived healthcare need and more frequent hospitalization were associated with lower suicidal ideation. Outpatient service use was positively associated with suicidal ideation ($\beta = 0.148$; $t = 9.013$; $p < 0.001$), whereas perceived healthcare need was strongly associated with more frequent hospitalization ($\beta = 0.632$; $t = 53.483$; $p < 0.001$).

Table 3 shows similar results between age groups and chronic disease statuses. Notably, climate anxiety was more strongly associated with suicidal ideation among adults aged 70 years or over than those aged between 50 and 69 years. Hospitalization was negatively associated with suicide ideation among participants aged between 50 and 69 years ($\beta = -0.091$; $t = -4.065$; $p < 0.001$) but positively associated with suicide ideation in the older age group ($\beta = 0.116$; $t = 3.083$; $p < 0.001$). Climate anxiety was more strongly associated with hospitalization ($\beta = 0.144$; $t = 9.657$; $p < 0.001$) and suicide ideation ($\beta = 0.202$; $t = 10.079$; $p < 0.001$) among individuals with no chronic diseases.

Table 4 shows the indirect regression coefficients from the primary adjusted model and stratification analyses. Climate anxiety was negatively associated with suicidal ideation through perceived healthcare need in the whole sample ($\beta = -0.039$; $p < 0.001$). Similarly, climate anxiety was negatively associated with suicidal ideation through perceived healthcare need and hospitalization ($\beta = -0.003$; $p < 0.05$). Climate anxiety was negatively associated with suicidal ideation through hospitalization ($\beta = -0.003$; $p < 0.05$). Thus, climate anxiety was associated with smaller scores of suicidal ideation through perceived healthcare need and hospitalization. In contrast, climate anxiety was associated with higher scores of suicidal ideation through perceived healthcare need and outpatient service use ($\beta = 0.008$; $p < 0.001$). There was a negative net association between climate anxiety through the three mediators on suicidal ideation ($\beta = -0.037$; $p < 0.001$).

Similar indirect associations between climate anxiety and suicidal ideation through perceived healthcare need, outpatient service use, and hospitalization were seen in the stratification analyses. There was a negative net association of climate anxiety through the three mediators on suicidal ideation in all groups (see Table 4). Yet, the net negative association between climate anxiety and suicidal ideation through the mediators was stronger in the younger group ($\beta = -0.044$; $p < 0.001$) than in the older group ($\beta = -0.013$; $p < 0.001$). Likewise, the net negative association between climate anxiety and suicidal ideation through the mediators was stronger among adults with at least one chronic disease ($\beta = -0.042$; $p < 0.001$) than among those without a chronic disease ($\beta = -0.026$; $p < 0.001$).

Table A3 shows the model fit statistics from all models. The fit indices of the nonadjusted models were not satisfactory, but all adjusted models yielded satisfactory fit indices. Model 2 yielded the best fit statistics, including $\text{chi} - \text{square} = 6.021$ at $p > 0.05$, GFI = 0.993, TLI = 0.997, and RMSEA = 0.011. Compared with the nonadjusted models, the adjusted models fitted well because they included the covariates. The presence of the covariates enhanced the explanatory power of the adjusted models or increased the total variance explained in the dependent variables, leading to a better fit.

5 | Discussion

This study investigated whether the relationship between climate anxiety and suicidal ideation is mediated by perceived healthcare need, outpatient service use, and hospitalization. The effect sizes were stratified between age groups and chronic disease status to maximize the robustness of the analysis.

The study found a positive association between climate anxiety and suicidal ideation, implying that larger scores of climate anxiety were associated with high suicidal ideation. This result is supported by previous studies that found a positive association between generalized anxiety and suicidal ideation [9, 10, 33]. Yet, none of the studies focused on older adults and considered climate anxiety. The result also corroborates the IPTS and 3ST, which imply that individuals who experience the provocative climate change events that cause climate anxiety would contemplate suicide, leading to suicidal ideation. An older person whose caregiver or spouse has died in a wildfire, for example, may develop morbid fear about climate change. According to the IPTS, this traumatic event can disable the fear of death and invoke a continuum of suicidality, which starts with suicidal ideation and ends with suicidal action. Although the confirmed relationship between climate anxiety and suicidal ideation is modest in magnitude, it warrants policy attention for two reasons. Firstly, the large sample size suggests that many individuals who reported high climate anxiety also reported high scores of suicidal ideation. Secondly, suicidal ideation is not only associated with provocative events but also with the psychological responses (e.g., climate anxiety) of such events [51].

The study further confirmed a net negative indirect association of climate anxiety with suicidal ideation, suggesting that hospitalization may function as an institutional buffering mechanism against suicide risk associated with climate anxiety. However, it is important to note that such forms of care largely reflect general healthcare utilization rather than specialized mental health services, which may have a limited impact on patients. This finding aligns with the 3ST, which posits that social connections play a critical role in reducing PB, TB, and an individual's capacity to engage in suicidal behavior [13]. Based on previous research [20, 52], social engagement with clinicians may prevent the onset of suicidal thoughts or the progression of such thoughts to severe suicidal ideation and suicidal action. Engagement with health professionals may provide emotional reassurance and supportive care that could help reduce fear of death and alleviate suicidal thoughts [53, 54].

Contrary to our expectation, outpatient service use was positively associated with suicidal ideation in the whole sample. This finding indicates that engagement with outpatient services does not necessarily correspond to lower levels of suicidal ideation among participants. Social interactions within outpatient settings are often brief and episodic, which may limit their capacity to address underlying psychological distress. The duration and intensity of such engagements may not be sufficient to provide sustained emotional support for individuals experiencing suicidal thoughts. Evidence from prior studies suggests that outpatient care in some African contexts may be characterized by structural constraints, including prolonged waiting times and patient dissatisfaction [55]. Although these contextual factors are not directly examined in the present study, they may offer a backdrop for understanding patterns of healthcare utilization. The observed association should, therefore, be interpreted with caution, as it reflects relationships within the data rather than a causal effect. This pattern may also reflect unmet healthcare needs, where individuals seek care but do not receive sufficient psychological support to reduce suicidal ideation.

TABLE 3 | Stratification of regression coefficients between age groups and chronic disease statuses ($N = 4147$).

Dependent variable	Path	Independent variable	Coefficients		SE	Critical ratio	Coefficients		SE	Critical ratio
			B	Beta (β)			*B*	Beta (β)		
			Age group: 50–69 years ($N = 2844$)				Age group: 70 years or over ($N = 1303$)			
Baseline										
Perceived healthcare need	<---	Climate anxiety	0.03	0.148***	0.004	7.988	0.046	0.220***	0.006	7.821
Hospitalization	<---	Climate anxiety	0.028	0.142***	0.003	9.900	0.010	0.049*	0.004	2.283
Outpatient service use	<---	Climate anxiety	0.003	0.017	0.003	0.986	−0.005	−0.023	0.005	−0.897
Suicide ideation	<---	Climate anxiety	0.088	0.134***	0.012	7.629	0.172	0.303***	0.016	10.814
Outpatient service use	<---	Perceived healthcare need	0.436	0.460***	0.016	27.33	0.466	0.479***	0.025	18.458
Hospitalization	<---	Perceived healthcare need	0.592	0.616***	0.014	42.821	0.664	0.674***	0.021	31.424
Suicide ideation	<---	Perceived healthcare need	−1.316	−0.406***	0.077	−17.092	−0.622	−0.228***	0.111	−5.629
Suicide ideation	<---	Hospitalization	−0.307	−0.091***	0.076	−4.065	0.320	0.116**	0.104	3.083
Suicide ideation	<---	Outpatient service use	0.620	0.182***	0.066	9.463	0.094	0.034	0.087	1.083
Adjusted										
Perceived healthcare need	<---	Climate anxiety	0.030	0.149***	0.004	8.040	0.046	0.220***	0.006	7.84
Hospitalization	<---	Climate anxiety	0.028	0.143***	0.003	9.963	0.01	0.049*	0.004	2.288
Outpatient service use	<---	Climate anxiety	0.003	0.017	0.003	0.993	−0.005	−0.023	0.005	−0.899
Suicide ideation	<---	Climate anxiety	0.088	0.134***	0.011	7.676	0.172	0.304***	0.016	10.839
Outpatient service use	<---	Perceived healthcare need	0.436	0.460***	0.016	27.33	0.466	0.479***	0.025	18.458
Hospitalization	<---	Perceived healthcare need	0.592	0.616***	0.014	42.821	0.664	0.674***	0.021	31.424
Suicide ideation	<---	Perceived healthcare need	−1.316	−0.406***	0.077	−17.092	−0.622	−0.228***	0.111	−5.629
Suicide ideation	<---	Hospitalization	−0.307	−0.091***	0.076	−4.065	0.32	0.116**	0.104	3.083
Suicide ideation	<---	Outpatient service use	0.62	0.182***	0.066	9.463	0.094	0.034	0.087	1.083
Covariates										
Climate anxiety	<---	CDS (ref–none)	−5.489	−0.157***	0.635	−8.642	0.520	0.015	0.959	0.543
Climate anxiety	<---	Gender (ref–women)	0.733	0.022	0.616	1.191	0.317	0.009	0.957	0.331

(Continues)

TABLE 3 | (CONTINUED)

Dependent variable	Path	Independent variable	Coefficients		SE	Critical ratio	Coefficients		SE	Critical ratio
			B	**Beta (β)**			***B***	**Beta (β)**		
Climate anxiety	<---	Education (years)	−0.745	−0.019	0.695	−1.072	−0.748	−0.021	1.029	−0.727
Climate anxiety	<---	SRH (ref–none)	−8.15	−0.200***	0.737	−11.051	−1.691	−0.045	1.069	−1.582
Climate anxiety	<---	Income (ref–< ¢2000)	1.283	0.037*	0.633	2.025	4.167	0.122***	0.975	4.273
			CDS: (none; $N = 2474$)				CDS: (one or more; $N = 1673$)			
Baseline										
Perceived healthcare need	<---	Climate anxiety	0.045	0.229***	0.004	11.678	0.027	0.128***	0.005	5.281
Hospitalization	<---	Climate anxiety	0.027	0.144***	0.003	9.630	0.016	0.078***	0.004	4.052
Outpatient service use	<---	Climate anxiety	0.002	0.010	0.003	0.560	−0.003	−0.016	0.004	−0.726
Suicide ideation	<---	Climate anxiety	0.119	0.201***	0.012	10.052	0.114	0.167***	0.015	7.793
Outpatient service use	<---	Perceived healthcare need	0.467	0.485***	0.017	26.891	0.41	0.429***	0.021	19.251
Hospitalization	<---	Perceived healthcare need	0.616	0.642***	0.014	42.956	0.601	0.604***	0.019	31.193
Suicide ideation	<---	Perceived healthcare need	−0.927	−0.310***	0.084	−11.036	−1.455	−0.450***	0.093	−15.717
Suicide ideation	<---	Hospitalization	0.030	0.010	0.083	0.365	−0.365	−0.112***	0.087	−4.17
Suicide ideation	<---	Outpatient service use	0.599	0.193***	0.068	8.785	0.265	0.078***	0.079	3.338
Adjusted										
Perceived healthcare need	<---	Climate anxiety	0.045	0.229***	0.004	11.712	0.027	0.128***	0.005	5.282
Hospitalization	<---	Climate anxiety	0.027	0.144***	0.003	9.657	0.016	0.078***	0.004	4.053
Outpatient service use	<---	Climate anxiety	0.002	0.010	0.003	0.562	−0.003	−0.016	0.004	−0.726
Suicide ideation	<---	Climate anxiety	0.119	0.202***	0.012	10.079	0.114	0.167***	0.015	7.795
Outpatient service use	<---	Perceived healthcare need	0.467	0.485***	0.017	26.891	0.410	0.429***	0.021	19.251
Hospitalization	<---	Perceived healthcare need	0.616	0.642***	0.014	42.956	0.601	0.604***	0.019	31.193
Suicide ideation	<---	Perceived healthcare need	−0.927	−0.310***	0.084	−11.036	−1.455	−0.450***	0.093	−15.717
Suicide ideation	<---	Hospitalization	0.030	0.010	0.083	0.365	−0.365	−0.112***	0.087	−4.17
Suicide ideation	<---	Outpatient service use	0.599	0.193***	0.068	8.785	0.265	0.078***	0.079	3.338

(Continues)

TABLE 3 | (CONTINUED)

Dependent variable	Path	Independent variable	Coefficients				Coefficients			
			B	**Beta (*β*)**	**SE**	**Critical ratio**	***B***	**Beta (*β*)**	**SE**	**Critical ratio**
Climate anxiety	<---	Age (ref–70 or above)	−0.703	−0.018	0.759	−0.926	−4.000	−0.115***	0.836	−4.787
Climate anxiety	<---	Gender (ref–women)	0.779	0.023	0.668	1.166	0.677	0.021	0.789	0.858
Climate anxiety	<---	Education (years)	0.087	0.002	0.722	0.121	−2.113	−0.055*	0.925	−2.284
Climate anxiety	<---	SRH (ref–none)	−12.865	−0.266***	0.937	−13.725	−0.777	−0.023	0.812	−0.957
Climate anxiety	<---	Income (ref–< ₵2000)	1.451	0.042*	0.668	2.173	4.212	0.124***	0.82	5.136

Note: β–standardized coefficient; *B*–unstandardized coefficient; SE–standard error of *B*.
Abbreviations: CDS, chronic disease status; SRH, self-reported health.
***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

The bidirectionality of the relationships should also be considered in future research and practice. The positive association between outpatient service use and suicidal ideation suggests that individuals who reported higher scores of suicidal ideation also reported less frequent outpatient service use. This thinking aligns with the literature, which suggests that individuals with suicidal thoughts are usually socially isolated [56]. Socially disengaged individuals are unlikely to use health services and benefit from them.

The direct relationships were generally consistent between the age groups and chronic disease statuses. Nevertheless, the net indirect negative association of climate anxiety with suicidal ideation through the mediators was stronger in the younger age group. This outcome suggests that inpatient health services were less strongly associated with lower levels of suicidal ideation in the older group, probably due to this group's higher vulnerability to disease and climate change [16]. More effort may be required to meet the psychological needs of older adults within clinical settings [25]. Hospitalization was associated with lower levels of suicidal ideation among people with chronic diseases, which may partly reflect the benefits of closer clinical monitoring and ongoing medical supervision within inpatient care settings [57]. Clinical care for people with chronic diseases is more empathetic and offers patients an environment in which they can engage with multiple professional groups [25, 58]. These thoughts and the results reveal implications for practice and future research.

Many of the confirmed relationships, including the association between climate anxiety and suicidal ideation, are weak. The relationship between climate anxiety and suicidal ideation reflects a low probability of individuals with high climate anxiety reporting suicidal ideation. Even so, the weak effect sizes are relevant to practice, given the relatively large sample size of the study and the significance of most of the weak effect sizes at $p < 0.001$ rather than $p < 0.05$. These thoughts and the results reveal implications for practice and future research.

5.1 | Implications for Practice

An increased prevalence of climate anxiety appears likely, given the growing frequency and intensity of extreme climate change events [4, 6]. The adverse impact of this trend on the health of older adults is partly mirrored in the association of climate anxiety with perceived healthcare need and hospitalization. This relationship suggests that the demand for healthcare would increase as climate change worsens. Given the strong positive correlation found between perceived healthcare need and hospitalization, stakeholders can expect the demand for healthcare to translate into hospitalizations. As proposed by scholars [59, 60], governments and healthcare providers need to prepare to meet a higher demand for healthcare in the future.

Meeting a growing demand for healthcare would require the scalability of healthcare provision through six collective actions: (1) the development or review of healthcare policies in response to emerging disease patterns; (2) the training, motivation, and retention of healthcare personnel; (3) continuous improvement

TABLE 4 | Indirect association of climate anxiety on suicide ideation.

Parameter	Coefficient (*B*)	95% CI (of *B*)		Total R^2
		Lower	Upper	
Whole sample ($N = 4147$)				
CA − > HN − > SI	−0.039***	−0.047	−0.030	0.123
CA − > HN − > OSU − > SI	0.008***	0.005	0.010	
CA − > HN − > HOSP − > SI	−0.003*	−0.006	0.000	
CA − > OSU − > SI	0.000	−0.003	0.003	
CA − > HOSP − > SI	−0.003*	−0.006	0.000	
Total	−0.037***	−0.045	−0.028	
Age group: (50–69 years; $N = 2844$)				
CA − > HN − > SI	−0.040***	−0.051	−0.029	0.176
CA − > HN − > OSU − > SI	0.008***	0.006	0.011	
CA − > HN − > HOSP − > SI	−0.005***	−0.009	−0.003	
CA − > OSU − > SI	0.002	−0.002	0.006	
CA − > HOSP − > SI	−0.009***	−0.013	−0.004	
Total	−0.044***	−0.046	−0.029	
Age group: (70 years or over; $N = 1303$)				
CA − > HN − > SI	−0.028***	−0.042	−0.017	0.103
CA − > HN − > OSU − > SI	0.002	−0.002	0.006	
CA − > HN − > HOSP − > SI	0.010**	0.004	0.016	
CA − > OSU − > SI	0.000	−0.003	0.001	
CA − > HOSP − > SI	0.003*	0.000	0.008	
Total	−0.013***	−0.015	−0.011	
CDS: (none; $N = 2474$)				
CA − > HN − > SI	−0.042***	−0.053	−0.032	0.095
CA − > HN − > OSU − > SI	0.013***	0.009	0.017	
CA − > HN − > HOSP − > SI	0.001	−0.004	0.005	
CA − > OSU − > SI	0.001	−0.003	0.005	
CA − > HOSP − > SI	0.001	−0.003	0.005	
Total	−0.026***	−0.029	−0.021	
CDS: (one or more; $N = 1673$)				
CA − > HN − > SI	−0.039***	−0.055	−0.024	0.252
CA − > HN − > OSU − > SI	0.003***	0.001	0.005	
CA − > HN − > HOSP − > SI	−0.006***	−0.010	−0.003	
CA − > OSU − > SI	−0.001	−0.004	0.001	
Total	−0.042***	−0.046	−0.038	

Note: B–unstandardized coefficient; HN–perceived healthcare need, HOSP-hospitalization; R^2 is the total variance on suicide ideation.
Abbreviations: CA, climate anxiety; CDS, chronic disease status; CI, confidence interval; SI, suicide ideation; OSU, outpatient service use.
***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

of healthcare quality; (4) an expansion of the healthcare infrastructure to meet the needs of the growing population; (5) making healthcare affordable or free-of-charge; and (6) the environmental-friendly adoption of emerging technologies, including telemedicine and artificial intelligence. Policy reviews and updates are necessary for realigning healthcare in response to changing needs, whereas the recruitment and training of personnel are necessary for augmenting care capacity against population growth. Sustainable adoption of emerging technologies such as telemedicine and remote monitoring systems would enhance access to healthcare [61].

Researchers recognize hospitalizations associated with climate anxiety as an economic burden and a public health problem [61, 62]. The evidence from this study, nonetheless, depicts hospitalization associated with climate anxiety as a potential channel through which individuals can access clinical support that is protective against suicidal ideation. Thus, investment aimed at strengthening sustained access to inpatient health services may be strategically important. Suicidal ideation is a mental health risk associated with lower personal productivity [63], whereas its progression to a suicide is tantamount to a loss of human capital. Interventions that protect the individual from suicidal ideation (e.g., improving access to inpatient health services) are, therefore, invaluable. The implied value of hospitalizations associated with climate anxiety is an incentive for governments to invest in their healthcare systems in response to climate change.

It is incumbent on stakeholders to improve access to healthcare personnel and facilities, especially those offering patient-centered inpatient services or overnight stays. Governments may improve the availability of personnel trained to provide empathetic patient-centered care for hospitalized patients, make wards more inviting and comfortable, and improve interprofessional practice. Improved interprofessional practice is a value-laden, multipurpose care model that is more likely to meet the complex needs of patients [64]. This type of care may enhance patient experience and potentially reduce the risk of suicidal ideation and its progression.

The stratification analysis demonstrates potential sensitivity of the indirect relationships across groups and underscores the need for future researchers to replicate or build upon our study. A stratification of the regression coefficients by climate change exposure levels, the type of physical environment (e.g., hot or cold), and other socioeconomic factors would deepen the insights from future studies.

Suicidal ideation is the beginning of the suicide continuum, which ends with an actual suicide [13]. The result of this study underscores the need for exploring, through longitudinal studies, whether climate anxiety can predict the progression of suicidal ideation to a lethal suicide attempt and suicide. Similarly, prospective research may be used to assess whether climate anxiety changes and increases healthcare demand and utilization over time. A promising future research goal is the replacement of hospitalization and outpatient service use in the structural model with specialist indicators such as psychiatric care use and hospitalization due to respiratory and cardiac disorders. Older adults use outpatient and inpatient services for different reasons, so capturing specific proxies of healthcare use in future analyses would broaden the scope of the evidence.

5.2 | Limitations

This study adopted a cross-sectional design and, therefore, does not establish causation between the variables or eliminate confounding bias. The confirmed associations could also be bidirectional, so the regression coefficients should be interpreted as statistical associations rather than causal pathways. To mitigate confounding, future studies may adopt a randomized controlled design. The evidence from this study may not be generalizable to the general Ghanaian population, given the study's focus on middle-aged and older adults. Ideally, the results should be interpreted within the sociocultural Ghanaian context, where community structures, social norms, and perceptions of mental health and healthcare utilization may influence both help-seeking behavior and experiences of psychological distress. Our measurement of hospitalization and outpatient service use did not incorporate the time spent or the number of healthcare professionals the participant engaged with at the healthcare facilities. Future researchers are encouraged to fill these gaps. The subjective measures used are vulnerable to social desirability bias, although the use of such measures was unavoidable since suicidal ideation and climate anxiety are psychological constructs.

6 | Conclusion

Climate anxiety is associated with higher perceived healthcare need, more frequent hospitalization, and higher suicidal ideation. It is indirectly associated with suicidal ideation through perceived healthcare need and hospitalization, with this relationship being stronger among younger individuals and those with at least one chronic disease. Therefore, climate anxiety is associated with patterns of healthcare utilization, and engagement with inpatient health services is associated with lower levels of suicidal ideation. These findings highlight the potential relevance of healthcare access in the context of climate-related psychological distress, although the observed relationships should be interpreted as associations rather than causal effects.

Author Contributions

N.A. conceived the research idea, wrote the original manuscript, and analyzed the data. C.Y., E.W.A., R.A-M.J., E.E., S.M.A., and G.B. supervised data collection and contributed to the conceptualization of the study. A.K.C. contributed to the revision and refinement of the literature review, discussion, and conclusion, and critically reviewed the manuscript.

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Disclosure

All authors proofread and approved the manuscript.

Conflicts of Interest

The authors declare no conflicts interest.

Data Availability Statement

The data used for this study will be made available by the corresponding author upon reasonable request.

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Appendix 1

TABLE A1 | Items of the original climate change anxiety scale.

No	Item	1	2	3	4	5	6	7
1	Thinking about climate change makes it difficult for me to concentrate.							
2	Thinking about climate change makes it difficult for me to sleep.							
3	I have nightmares about climate change.							
4	I find myself crying because of climate change.							
5	I think, "why can I not handle climate change better?"							
6	I go away by myself and think about why I feel this way about climate change.							
7	I write down my thoughts about climate change and analyze them.							
8	I think, "why do I react to climate change this way?"							
9	My concerns about climate change make it hard for me to have fun with my family or friends.							
10	I have problems balancing my concerns about sustainability with the needs of my family.							
11	My concerns about climate change interfere with my ability to get work or school assignments done.							
12	My concerns about climate change undermine my ability to work to my potential.							
13	My friends say I think about climate change too much.							

Note: 1—*not at all*, 2—*practically never*, 3—*seldom*, 4—*sometimes*, 5—*most of the time*, 6—*almost always*, and 7—*always*.

TABLE A2 | Items of the suicide ideation scale.

		Response				
#	Statement	1	2	3	4	5
1	I wish I could drift off to sleep and never wake up.					
2	I want to end my life.					
3	I feel like a constant burden to the family.					
4	I wish I would pass away in my sleep.					
5	**My life is meaningful.**					
6	If things get worse, I will end my life.					
7	I generally feel pretty worthless.					
8	**I have something to live for.**					
9	There is nothing further I can do to help.					
10	**My life still has dignity.**					

Note: 1—*strongly disagree*, 2—*disagree*, 3—*somewhat agree*, 4—*agree*, and 5—*strongly agree*Items in bold are reverse-coded.

Appendix 2

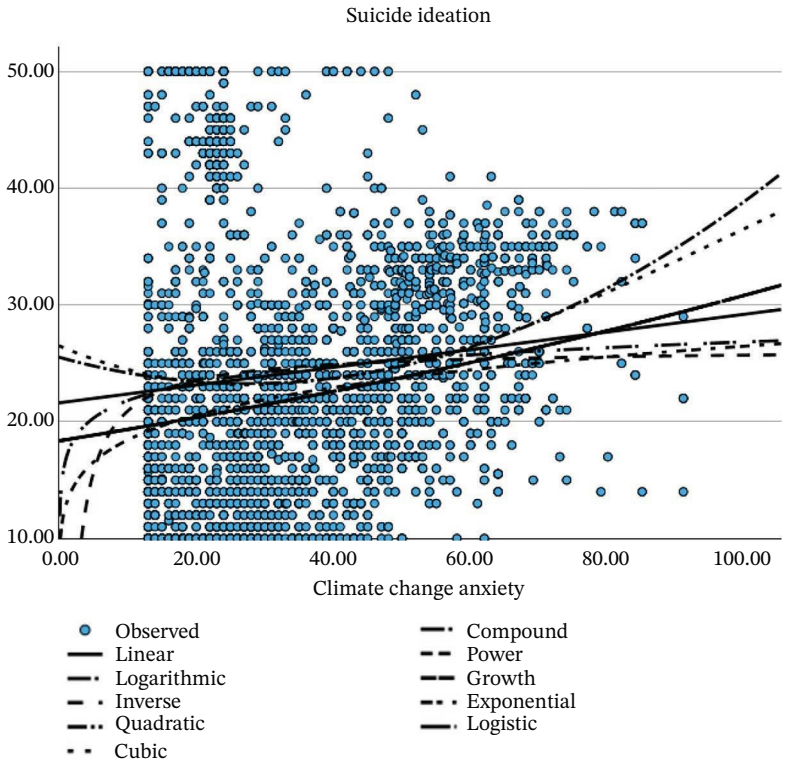

FIGURE A1 | Curve estimation of the relationship between climate anxiety and suicidal ideation ($N = 4147$; $R^2 = 0.015$; $F = 61.51$; $p < 0.001$).

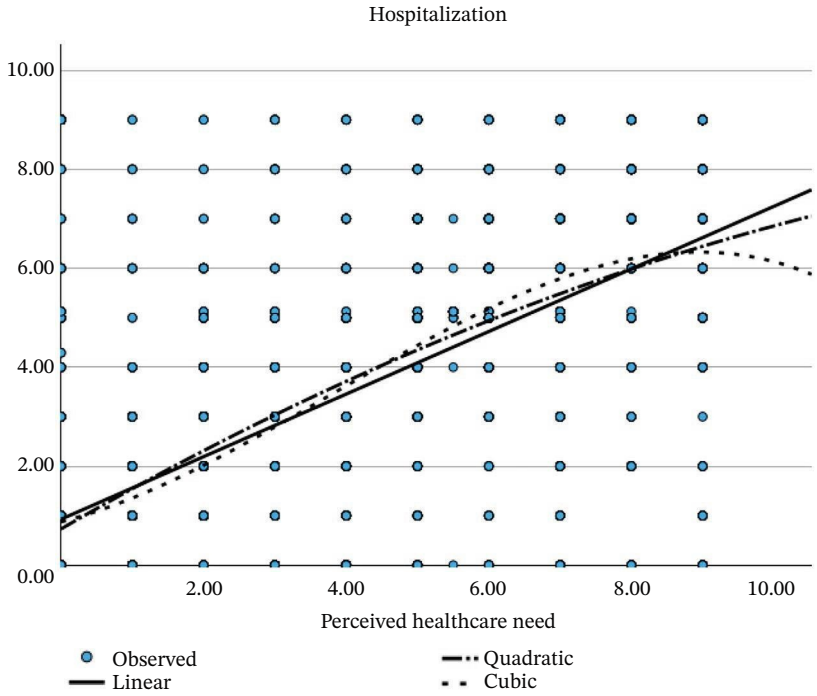

FIGURE A2 | Curve estimation of the relationship between perceived healthcare need and hospitalization ($N = 4147$, $R^2 = 0.426$; $F = 3074.02$; $p < 0.001$).

TABLE A3 | Fit indices from the adjusted and nonadjusted models.

Model	Chi-square	GFI	TLI	RMSEA
Nonadjustment models				
Whole sample ($N = 4147$)	201.92 ($p < 0.05$)	0.932	0.921	0.096
Age group: (50–69 years; $N = 2844$)	192.09($p < 0.05$)	0.922	0.941	0.122
Age group: (70 years or over; $N = 1303$)	194.11($p < 0.05$)	0.913	0.914	0.093
CDS: (none; $N = 2474$)	201.19($p < 0.05$)	0.921	0.909	0.101
CDS: (one or more; $N = 1673$)	204.12($p < 0.05$)	0.932	0.922	0.142
Adjusted models				
Whole sample ($N = 4147$)	23.091 ($p > 0.05$)	0.987	0.988	0.032
Age group: (50–69 years; $N = 2844$)	6.021($p > 0.05$)	0.993	0.997	0.011
Age group: (70 years or over; $N = 1303$)	7.021($p > 0.05$)	0.998	0.999	0.012
CDS: (none; $N = 2474$)	10.391($p > 0.05$)	0.988	0.999	0.013
CDS: (one or more; $N = 1673$)	11.011($p > 0.05$)	0.989	0.997	0.019

Abbreviations: CDS, chronic disease status; GFI, goodness of fit index; RMSEA, root mean square error of approximation; TLI, Tucker–Lewis index.