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Climate Change and Emerging Dermatologic Diseases in the Americas: A Review of Shifting Exposures and Vulnerable Populations

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Abstract
Climate change is altering disease dynamics across the Americas, including a rising burden of skin diseases. As the body's outermost barrier, the skin is highly vulnerable to climate-related exposures such as ultraviolet radiation, expansion of disease-carrying vectors, wildfires, pollution, and population displacement. This review examines the dermatologic consequences of climate change through a synthesis of forty peer-reviewed studies published between 2000 and 2025. Studies were identified using PubMed, Scopus, and Web of Science, focusing on climate-related skin conditions across North, Central, and South America. Results highlight the geographic spread of vector-borne diseases such as Lyme disease and cutaneous leishmaniasis, rising ultraviolet-related skin cancers, and worsening of inflammatory skin conditions due to air pollution and wildfire smoke. Children, outdoor workers, and displaced populations face heightened risks, compounded by limited access to dermatologic care. The findings underscore the need for climate-informed clinical practice, improved surveillance systems, and public health interventions designed to address environmental and social vulnerability in dermatologic care.

Plain Language Summary
As the planet warms, our skin, our body's first line of defense, is increasingly affected by environmental changes. This review explores how climate change is influencing skin health across the Americas. Warmer temperatures and shifting rainfall patterns have expanded the range of disease-carrying insects, increasing the spread of infections like Lyme disease and cutaneous leishmaniasis. Higher levels of ultraviolet radiation are contributing to more cases of sun-related skin cancer. Wildfire smoke and air pollution are worsening conditions like eczema and other inflammatory skin diseases. Children, outdoor workers, and people who have been displaced by climate disasters are especially vulnerable to these risks. Many of these groups also face challenges accessing dermatologic care. This review calls on dermatologists and public health leaders to prepare for the growing impact of climate change on skin health by improving access to care, enhancing education and training, and advocating for communities most at risk.

Keywords: Climate Change, Dermatologic Disease, Vector-Borne Dermatoses, UV Exposure, Wildfire Pollution, Pediatric Dermatology, Displacement Migration

Abbreviations

- **UV:** Ultraviolet
- **UV-A:** Ultraviolet A (315–400 nm)
- **UV-B:** Ultraviolet B (280–315 nm)
- **UV-C:** Ultraviolet C (100–280 nm)
- **NMSC:** Nonmelanoma Skin Cancer
- **CMM:** Cutaneous Malignant Melanoma
- **PM2.5:** Particulate Matter less than 2.5 microns in diameter
- **CO:** Carbon Monoxide
- **NOx:** Nitrogen Oxides
- **PAHs:** Polycyclic Aromatic Hydrocarbons
- **VOCs:** Volatile Organic Compounds
- **O_3:** Ozone
- **AhR:** Aryl Hydrocarbon Receptor
- **ROS:** Reactive Oxygen Species
- **TP53, PTCH1, CDKN2A:** Tumor Suppressor Genes (associated with skin carcinogenesis)
- **CPDs:** Cyclobutane Pyrimidine Dimers
- **CLM:** Cutaneous Larva Migrans
- **IDPs:** Internally Displaced Persons
- **AD:** Atopic Dermatitis
- **AAD:** American Academy of Dermatology

Introduction

Climate change is a defining global health threat of the 21st century, with far-reaching consequences for human physiology, infrastructure, and ecosystems. While its impacts on respiratory, cardiovascular, and infectious diseases are well-documented, the dermatologic manifestations of climate change remain comparatively underexplored [1-3]. As the organ most directly exposed to the environment, the skin serves as both a physical barrier and a visible indicator of environmental stressors such as UV radiation, airborne pollutants, vector-borne pathogens, and temperature extremes. In recent decades, mounting evidence has demonstrated the dermatologic implications of climate-linked phenomena such as ozone depletion, heat waves, wildfires, and extreme weather events [4-6]. These shifts have contributed to the geographic expansion of vector-borne skin diseases, increased incidence of UV-induced skin cancers, and higher rates of inflammatory dermatoses triggered by air pollution and psychosocial stress [7-9]. Vulnerable populations, comprising mainly children, rural laborers, migrants, and Indigenous communities, are often disproportionately affected due to structural inequities in healthcare access, housing, and occupational protections [10-12]. Despite these findings, dermatology has been underrepresented in clinical and policy discussions on climate resilience and public health preparedness. The literature is fragmented, with most studies focusing on isolated exposures or single disease categories. Comprehensive reviews integrating the full spectrum of climate-related dermatologic disease across geographies, populations, and mechanisms, are lacking. To address this gap, the present review synthesizes evidence on the dermatologic consequences of climate change across the Americas, drawing from 40 peer-reviewed publications spanning 2000 to 2025. The review is thematically organized around five key climate-linked exposure pathways: Vector-Borne Dermatoses; UV Exposure Dermatoses; Wildfires, Air Pollution, and Cutaneous Health; Pediatric Vulnerability to Climate-Related Skin Disease; and Climate Migration and Displacement Cutaneous Impacts in Mobile Populations by examining these intersecting domains, this work aims to illuminate how environmental change is reshaping the landscape of skin disease and to support clinicians, researchers, and public health officials in anticipating and addressing these emerging challenges. Dermatology has a critical role to play in climate adaptation, and this review highlights opportunities for equity-centered interventions, surveillance, and interdisciplinary collaboration.

Materials and Methods

This review was conducted in accordance with narrative synthesis guidelines to summarize the dermatologic implications of climate change across the Americas. A comprehensive literature search was carried out across three major databases: PubMed, Scopus, and Web of Science, covering the period from January 1, 2000 to March 30, 2025. The search strategy incorporated a combination of Medical Subject Headings (MeSH) and free-text keywords pertaining to climate change, dermatologic conditions, and regional geography. Search terms included combinations of: ("climate change" OR "global warming" OR "climate variability" OR "extreme weather" OR "environmental change") AND ("skin disease" OR "dermatologic condition" OR "cutaneous disease" OR "skin cancer" OR "photodermatoses" OR "contact dermatitis") AND ("Americas" OR "North America" OR "South America" OR "Central America" OR "Latin America" OR "Carib-bean" OR "United States" OR "Canada" OR "Mexico" OR "Brazil" OR "Argentina" OR "Peru" OR "Colombia" OR "Chile") AND ("vector-borne" OR "UV exposure" OR "ultra-violet radiation" OR "sun exposure" OR "wildfire" OR "pollution" OR "air quality" OR "climate migration" OR "displacement" OR "environmental exposure" OR "occupational exposure" OR "rural health" OR "pediatric"). Boolean operators were applied to optimize inclusivity while maintaining relevance.

Inclusion and Exclusion Criteria

Eligible studies met the following criteria: Peer-reviewed articles, case reports, reviews, surveillance data, and public health policy papers; Focus on dermatologic diseases linked to climate change or environmental exposure; Study populations located within the Americas (North, Central, South America, and the Caribbean); Publications in English between 2000 and 2025. The following were excluded: Non-dermatologic health outcomes (e.g., cardiovascular or respiratory conditions); Genetic skin disorders with no environmental linkage; Studies conducted outside the Americas; Animal-only studies, unless directly relevant to zoonotic transmission.

Study Selection and Data Extraction

Following de-duplication, titles and abstracts were screened independently by two authors to assess relevance. Full texts were then reviewed for inclusion based on the above criteria. From each eligible study, the following data were extracted: study design, country or region, climate- related exposure type, dermatologic condition(s), affected population(s), and key findings (Table 1).

Table 1: Metadata Table of Included Studies and Reports.

Title	Authors	Year	Exposure Type	Population	Conditions	Region	Key Findings	Category
The Infectious and Noninfectious Dermatological Consequences of Flooding	Bandino et al.	2015	Flooding (disaster-related)	Disaster-affected, global	Bacterial/fungal infections, contact dermatitis, atopic dermatitis, immersion injuries	Global (focus on U.S.)	Flooding increases risk of infectious (e.g., Vibrio, Aeromonas) and noninfectious dermatoses	Extreme weather / migration
Schistosomes in the Southwest US	Brant et al.	2009	Waterborne parasites	Recreational water users	Cercarial dermatitis (swimmer's itch)	Southwestern US	Schistosome exposure poses underrecognized risk in SW U.S.	Vector-borne / Waterborne
The Effects of Climate Change on Infectious Diseases with Cutaneous Manifestations	Coates & Norton	2020	Climate-sensitive infectious diseases	Global	Dengue, Zika, Chikungunya, Leishmaniasis, etc.	Global (focus on U.S.)	Warming, migration, and extreme weather increase burden of infectious dermatoses	Vector-borne / Migration / Policy
Impact of Climate Change on Dermatological Conditions Related to Flooding	Dayrit et al.	2018	Flooding	Flood survivors	Scabies, impetigo, tinea, inflammatory dermatoses	Global (focus on U.S.)	Post-flood skin diseases rise 20%; many preventable	Extreme weather / Infections
Infectious Tropical Travel Rashes and the Impact of Climate Change	Dinulos et al.	2022	Travel/tropics + warming	Travelers to tropics	Leishmaniasis, Chagas, CLM, myiasis	Tropical to temperate migration	Vector-borne dermatoses expanding to new latitudes with climate change	Vector-borne / Migration
Wildfire Air Pollution and Health Care Use for Atopic Dermatitis and Itch	Fadadu et al.	2021	Wildfire smoke (PM2.5)	Pediatric & adult dermatology patients	Atopic dermatitis, itch	California (urban area, Camp Fire)	Increased wildfire PM2.5 linked to spikes in AD visits and medication use	Wildfire / Pollution
Climate Change and Inpatient Dermatology	Fathy & Rosenbach	2020	General climate change effects	Hospitalized patients	Heat-related dermatoses, vector diseases, UV disorders	Global (focus on U.S.)	Hospital dermatologists will increasingly manage unfamiliar climate-associated skin conditions	Inpatient / Policy
Future Area Burned in Canada	Flannigan et al.	2005	Wildfires (projected increase)	General population	N/A (focus on fire projections)	Canada	Projected 74–118% increase in area burned; relevant for environmental dermatology risk	Wildfire / Environmental risk

Impact of Climate and Weather on Vector-Borne Diseases	Fouque & Reeder	2019	Temperature, rainfall changes	General, especially fringe climates	Malaria, arboviruses, leishmaniasis	Global	Fringe zones and nonimmune populations most affected by expanding vector diseases	Vector-borne / Equity
Climate Change and Risk of Leishmaniasis in North America	González-Rosas et al.	2010	Temperature rise, ecological shift	North American residents	Cutaneous leishmaniasis	North America (U.S., Mexico)	Ecological models show northward expansion of leishmaniasis risk zones	Vector-borne / Modeling
The Burden of Air Pollution on Skin Health	Mangual et al.	2023	Wildfire-related air pollution (CO, PM2.5)	Urban residents (Boston), post-wildfire	Atopic dermatitis, eczema	Northeastern USA	CO spikes post-wildfire in 2023 correlated with eczema/AD clinic visit spikes	Wildfire / Pollution
Local Mosquito-Borne Transmission of Zika Virus	Likos et al.	2016	Mosquito-borne arbovirus (Zika)	South Florida residents	Zika-associated rash	Miami-Dade and Broward Counties, Florida	Zika virus transmitted locally in the US due to favorable mosquito conditions	Vector-borne / Urban
Ticking Time Bomb? Climate Change and Ixodes scapularis	Levy	2014	Tick vector expansion due to warming	North American populations	Lyme disease	Northeast and Canada	Warming expands range and survival of Ixodes ticks, increasing Lyme risk	Vector-borne / UV/Temp
Predicting the Speed of Tick Invasion	Leighton et al.	2012	Temperature and ecological modeling	Canadian regions	Lyme disease (Ixodes scapularis)	Southern and Eastern Canada	Model predicts rapid northward tick range expansion; Lyme risk zone increasing	Vector-borne / Modeling
Mass Migration and Climate Change Dermatologic Manifestations	Kwak et al.	2020	Mass displacement	Refugees, migrants	Scabies, lice, impetigo, CLM, HIV-related dermatoses	Global (Latin America)	Displacement fosters ectoparasitic and infectious dermatoses in vulnerable groups	Climate Migration
Influences of Environmental Chemicals on Atopic Dermatitis	Kim	2015	Environmental pollutants and irritants	Urban children/adults	Atopic dermatitis	Industrialized urban areas	Air pollutants (PM2.5, ozone, heavy metals) correlate with rising AD prevalence	Pollution / Pediatric

Association of Pollution and Climate with Atopic Eczema in US Children	Kathuria & Silverberg	2016	Ambient air pollution and climate	US children (n=91,642)	Eczema (atopic dermatitis)	USA (national)	PM, NO_2, SO_2, metals linked to eczema prevalence; UV and humidity modulate effects	Pollution / Pediatric / Epidemiology
The Effect of Climate Change on Skin Disease in North America	Kaffenberger et al.	2016	Climate warming (comprehensive)	North American populations	Leishmaniasis, Lyme, fungal infections, jellyfish stings, etc.	North America	Climate change expands vector-borne, aquatic, and environmental skin disease risks	Comprehensive / Climate overview
AhR Links Atopic Dermatitis and Air Pollution via Artemin	Hidaka et al.	2016	PAH exposure (pollution)	Experimental mice, human biopsy samples	Atopic dermatitis	Global	Air pollutants activate AhR → artemin upregulation → pruritus, barrier dysfunction	Pollution / Molecular Mechanism
Climate Change Increasing Risk of Autumn Wildfires in CA	Goss et al.	2020	Autumn wildfire conditions	California residents	N/A	California	Autumn fire weather extremes have doubled since 1980s due to warming/drying	Wildfire / Environmental Risk
Climate change, dermatology, and the time for real action	Rosenbach M	2019	Comprehensive (climate change-related skin impacts)	Global dermatology patients	Wildfire burns, infectious diseases, UV-related disorders	Global	Climate change already affecting dermatology practice—need for advocacy and training	Wildfires / Policy
Primary Cutaneous Coccidioidomycosis: An Update	Reyna-Rodríguez I et al.	2020	Fungal spore exposure (soil, dust)	Rural populations in endemic areas	Primary cutaneous coccidioidomycosis	Mexico, US Southwest	Climate change may be expanding the endemic range of Coccidioides	Vector-borne / Mycotic Dermatoses
Association between climate, pollution and hospitalization for pemphigus in the USA	Ren Z et al.	2018	Air pollution, climate variation	US hospital patients with pemphigus	Pemphigus vulgaris	United States	Hospitalization for pemphigus correlated with PM2.5, ozone, and temperature	Pollution / Autoimmune
Lutzomyia vectors for cutaneous leishmaniasis in Southern Brazil	Peterson AT, Shaw J	2003	Sandfly vector modeling	Brazilian regions at risk	Cutaneous leishmaniasis	Southern Brazil	Modeling predicts spread of leishmaniasis vector due to warming trends	Vector-borne / Modeling

The influence of climate change on skin cancer incidence	Parker ER	2020	UV exposure increase due to ozone changes and warming	Outdoor workers, fair-skinned populations	Melanoma, NMSC	Global (focus on U.S.)	UV radiation increase and climate behaviors raising skin cancer incidence	UV Exposure / Cancer
Changing geographic ranges of ticks and tick-borne pathogens	Ogden NH et al.	2013	Ecological shifts in tick habitat	North America, temperate zones	Lyme disease	Canada, U.S. Northeast	Tick habitat ranges expanding with climate change, increasing Lyme risk	Vector-borne / Zoonotic
Active and Passive Surveillance and Phylogenetic Analysis of Borrelia	Ogden NH et al.	2010	Tick surveillance, ecological change	Canadian populations	Lyme disease	Eastern and Central Canada	Tick populations and Borrelia strains are diversifying and expanding northward	Vector-borne / Surveillance
The effects of exposure to solar radiation on human health	Neale RE et al.	2023	UV radiation, ozone recovery	Global (with modeling for US)	Skin cancer, photodermatoses	Global (focus on U.S.)	Montreal Protocol prevented millions of future skin cancer cases; UV remains critical variable	UV Exposure / Health Policy
Incidence of Endemic Human Cutaneous Leishmaniasis in the United States	McIlwee BE et al.	2018	Vector exposure (sandflies)	US patients (non-travel)	Cutaneous leishmaniasis	Texas and southern U.S.	59% of cases were endemic; risk zone is under-recognized and growing	Vector-borne / Endemic
Coccidioidomycosis Acquired in Washington State	Marsden-Haug N et al.	2012	Fungal spore inhalation (dust exposure)	Residents with no travel to endemic zones	Coccidioidomycosis (skin manifestations)	Pacific Northwest	First evidence of autochthonous coccidioidomycosis in WA due to environmental shift	Vector-borne / Emerging Infections
Climate controls on valley fever incidence in Kern County	Zender & Talamantes	2006	Dust storms, soil dryness	Kern County, CA residents	Coccidioidomycosis	Southwestern US	Dry, dusty conditions correlate with fungal spore spread; supports climate-disease link	Fungal / Environmental
Impact of Spring Bird Migration on Tick Population	Wu et al.	2016	Bird-driven vector expansion	Northeastern US, Canada	Lyme disease	Northeast North America	Bird migration plays key role in Lyme vector expansion (Ixodes scapularis)	Vector-borne / Zoonotic

Global warming and heat-related illness	Williams	2020	Extreme heat	Elderly, children, vulnerable populations	Heat rash, thermoregulatory dysfunction	Global	Heat illness incidence will rise with warming; dermatologists must adapt	Extreme Heat / Thermoregulation
Cutaneous Leishmaniasis in Canadian Patients	Veillet-Lemay et al.	2018	Imported vector-borne disease	Travelers returning to Canada	Cutaneous leishmaniasis	Canada	Highlights diagnostic complexity and emerging tropical infections	Vector-borne / Migration
Ozone Depletion and UV Exposure	Umar & Tasduq	2022	Ozone depletion, UV radiation	Global, fair-skinned	Skin cancer, photodamage	Global	Rising UV risk challenges Vitamin D balance; need for education and protection	UV Exposure / Cancer
Climate Change and Dermatology	Abigail	2021	Multifactorial (pollution, migration, UV)	General population	Infectious dermatoses, AD, skin cancer	United States	Pandemic disrupted climate action; dermatology should lead climate-aware care	Comprehensive / Call to Action
Wildfires and Aerosols in the Western US	Spracklen et al.	2009	Wildfire smoke, PM2.5	Western US residents	Pollution-related skin flare-ups	Western US	Wildfires projected to double aerosols; skin & respiratory health impact	Wildfire / Pollution
Climate Change and Pediatric Skin Health	Schachtel et al.	2020	Heat, vector, pollution, UV	Children	AD, infestations, psychodermatoses	Global	Children's physiological immaturity heightens climate-related skin risk	Pediatrics / Vulnerability
Pediatric Dermatologists as Climate Advocates	Schachtel & Boos	2019	General climate crisis	Pediatric dermatologists, children	Pediatric dermatologic spectrum	Global	Pediatric dermatologists should be educators and policy advocates	Pediatrics / Advocacy
Trends in Vector-borne Disease Cases, 2004–2016	Rosenberg et al.	2018	Tick and mosquito transmission	US and Territories	Lyme, Zika, chikungunya, dengue	United States	Vector-borne cases doubled; Lyme = 82% of tick-borne reports	Vector-borne / Epidemiology

Thematic Synthesis and Framework

Findings were categorized under five major themes based on recurring dermatologic-climate linkages: Vector-Borne Dermatoses; UV Exposure and Skin Cancer; Wildfires, Air Pollution, and Cutaneous Health; Pediatric Vulnerability to Climate-Related Skin Disease; and Climate Migration and Displacement: Cutaneous Impacts in Mobile Populations. Each theme was structured to include epidemiologic trends, pathophysiologic mechanisms, population-level risk factors, and implications for clinical practice and policy.

Data Availability

All data analyzed in this review were derived from publicly available published literature. No new datasets were generated during the course of this study. References and supplementary figures or tables can be provided upon request or are included within the submitted manuscript.

Data

Overview of key studies reviewed in this manuscript, organized by exposure type, affected population, dermatologic condition, and geographic region. This table synthesizes data from peer-reviewed articles, reports, and surveillance papers published between 2003 and 2025. It includes study metadata used in the thematic synthesis of this review, with sources spanning dermatology, environmental health, climate science, and global public health.

Results, or a Descriptive Heading About the Results

Vector-Borne Dermatoses

Vector-borne skin diseases are among the most sensitive indicators of climate instability. As global temperatures rise and ecosystems shift, arthropod vectors such as ticks, sandflies, and mosquitoes are expanding their geographic and seasonal range across the Americas. In parallel, ecologically linked fungal pathogens like Coccidioides spp. are emerging in new endemic zones. This section explores how these environmental changes are reshaping the epidemiology of dermatologic diseases, with implications for diagnosis, surveillance, and public health planning.

Vector-borne Diseases: are increasingly recognized as a major dermatologic concern in the context of climate change. Rising global temperatures, altered rainfall patterns, habitat fragmentation, and ecological disruptions are enabling the expansion of vector habitats, extending the geographic and seasonal range of arthropod vectors such as Ixodes ticks and Lutzomyia sandflies. These environmental shifts have profound implications for the epidemiology and burden of skin diseases caused by vector-transmitted pathogens. Multiple studies document the northward expansion of Ixodes scapularis, the primary vector of Borrelia burgdorferi (Lyme disease), across the United States and Canada [13-15]. This shift is facilitated not only by warming winters but also by bird migration patterns, which act as a dispersal mechanism for ticks [16]. Lyme disease remains the dominant vector-borne dermatologic condition in North America, with cases more than doubling between 2004 and 2016 [7]. Similarly, Lutzomyia sandflies, responsible for transmitting cutaneous leishmaniasis, have expanded their range due to warming trends. Studies in Brazil and the southern U.S. predict that previously non-endemic areas will see increased cases, many without travel history [17-19]. Importantly, climate migration and armed conflict have facilitated the spread of leishmaniasis beyond its traditional tropic boundaries, as evidenced by imported cases in Canada and the U.S. [20, 21]. Other climate-sensitive vector-borne dermatoses include Zika, dengue, and chikungunya, which frequently present with exanthematous rashes. These have become increasingly relevant in U.S. states such as Florida due to the favorable climate for Aedes mosquito vectors [22, 23]. The CDC has reported a steady rise in mosquito-borne illness outbreaks in U.S. territories and southern states [7].

Finally, climate-driven increases in dust storms and drought have facilitated the spread of Coccidioides spp., the fungal cause of coccidioidomycosis. This condition, while not arthropod-transmitted, is considered ecologically vector-borne due to its strong dependence on environmental change. Studies in Arizona, California, and Washington have shown emerging endemic zones associated with warming, dryness, and airborne spore dispersal [24-26]. In summary, climate change is reshaping the landscape of vector-borne dermatoses in the Americas, demanding enhanced surveillance, physician awareness, and public health preparedness.

Table 2: Summary of Climate-Sensitive Vector-Borne Dermatoses.

Disease	Vector	Climate Driver	Geographic Shift	Dermatologic Manifestations	Key References
Lyme	Ixodes (ticks)	Warmer winters, migratory birds	Northward across US/Canada	Erythema migrans, acrodermatitis	[7, 13]
Leishmaniasis	Lutzomyia (sandflies)	Warming, urbanization	Into southern US, Canada (imported)	Ulcers, nodules, plaques	[19, 21]
Zika	Aedes (mosquitoes)	Rainfall, temperature	US Southeast, Caribbean	Morbilliform rash, conjunctivitis	[22]
Coccidioidomycosis	Coccidioides spp. (soil fungi)	Drought, windstorms	WA, AZ, CA	Papules, ulcers	[24, 25]

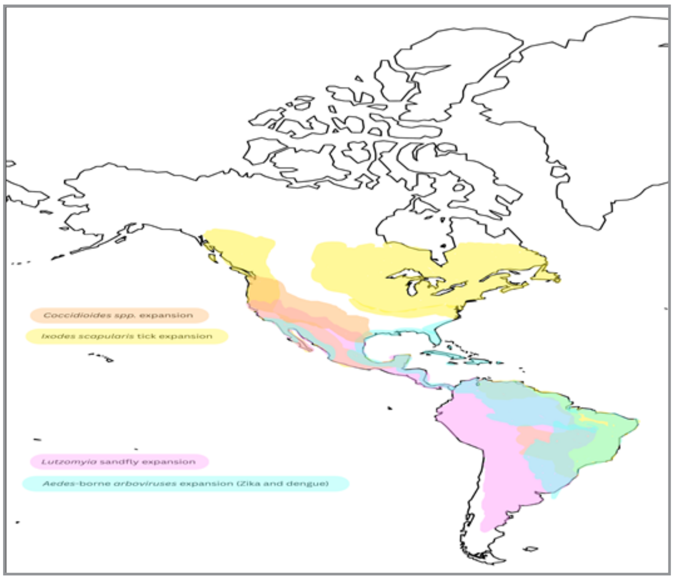

Figure 1: Geographic Expansion of Key Vector-Borne Dermatoses in the Americas (2000–2025).

This map visualizes the climate-driven expansion of major vector-borne and ecologically linked dermatoses across the Americas over the past 25 years. Geographic shifts include: (1) Ixodes scapularis tick expansion associated with Lyme disease in the northeastern and midwestern United States and into parts of Canada; (2) Lutzomyia sandfly expansion and increased cutaneous leishmaniasis cases in Brazil, Mexico, and emerging zones in the southern United States; (3) increasing incidence of Aedes-borne arboviruses (Zika and dengue) in Florida, Puerto Rico, and the Gulf Coast; and (4) newly identified endemic regions of coccidioidomycosis caused by Coccidioides spp. in Arizona, California, and Washington. Adapted from: [7,15,18,19,21,23-25]

UV Exposure and Skin Cancer

UV radiation is a well-established environmental carcinogen and one of the most significant extrinsic risk factors for skin disease. Climate change is contributing to increased UV exposure through a combination of ozone layer depletion, behavioral modifications driven by rising ambient temperatures, and increased surface reflectivity in certain geographies. These changes have considerable implications for the incidence, distribution, and severity of photodermatoses, particularly non-melanoma skin cancers (NMSC) and cutaneous malignant melanoma (CMM).

Table 3: UV-Related Skin Conditions by Mechanism and Population.

Condition	Pathophysiologic Mechanism	High-Risk Populations
Actinic Keratosis (AK)	UV-B induced DNA damage; TP53 mutations	Outdoor workers, elderly, fair skin
Basal Cell Carcinoma (BCC)	UV-B and UV-A exposure; PTCH1 mutations; chronic sun exposure	Fair skin, UV-exposed occupations
Squamous Cell Carcinoma (SCC)	Cumulative UV-B damage; immunosuppression	Immunocompromised individuals, elderly, fair skin
Cutaneous Malignant Melanoma (CMM)	Intermittent UV exposure; DNA damage in melanocytes; CDKN2A mutation	Light-skinned adolescents and young adults
Solar Lentigines	Melanocyte hyperplasia due to chronic UV exposure	Middle-aged individuals with cumulative sun exposure
Polymorphous Light Eruption (PMLE)	Immune response to UV-induced neoantigens	Young adults, light skin types
Phototoxic Drug Eruptions	UV-activated photosensitizers producing reactive oxygen species (ROS)	Medication users (e.g., tetracyclines, fluoroquinolones)
Vitamin D Deficiency	Avoidance of UV exposure limiting cutaneous cholecalciferol (vitamin D3) synthesis	Infants, elderly, darker skin tones, high-latitude dwellers

Ozone Depletion and Surface-Level UV Radiation

Stratospheric ozone plays a crucial role in filtering out harmful UV-B (280–315 nm) and UV-C (100–280 nm) radiation. Although the Montreal Protocol and its amendments have significantly mitigated the most severe ozone loss scenarios, the ongoing partial depletion and slow recovery of the ozone layer continue to contribute to elevated levels of UV-B radiation reaching the Earth's surface. This heightened UV-B exposure disrupts the balance between the beneficial synthesis of cholecalciferol (vitamin D_3) and the harmful induction of pyrimidine dimer formation, which is the molecular precursor to UV-induced DNA damage and skin carcinogenesis [27]. Neale et al. (2023) modeled the potential cumulative impact of historical and projected UV exposure and found that the Montreal Protocol has likely prevented millions of future skin cancer cases globally, especially in high-risk latitudes in the Americas [4]. Nonetheless, ambient UV exposure remains high, particularly during prolonged periods of sunshine linked to climate-induced droughts and seasonal shifts in cloud cover.

Climate-Driven Behavioral Changes and Exposure Risk

Independent of ozone dynamics, climate change influences human behavior in ways that affect cutaneous UV burden. Warmer global temperatures have led to increased time spent outdoors for both occupational and recreational purposes. Parker (2021) notes that individuals engaged in outdoor labor, such as agricultural workers, construction crews, and landscapers, are at elevated risk of cumulative actinic damage [12]. This damage manifests clinically as solar lentigines, actinic keratoses (AKs), and in many cases, progresses to squamous cell carcinoma (SCC) and basal cell carcinoma (BCC). Moreover, increased skin exposure due to less clothing coverage in warmer climates contributes to greater surface area vulnerability. These behavioral adaptations are often socioeconomically stratified, disproportionately affecting rural and underserved populations who may lack access to photoprotection, dermatologic surveillance, or oncologic care.

Photocarcinogenesis and Regional Epidemiologic Trends

The pathogenesis of UV-induced skin cancer is multifactorial. UV-B radiation induces direct DNA damage via the formation of cyclobutane pyrimidine dimers (CPDs), while UV-A (315–400 nm) contributes to oxidative stress and indirect DNA damage through reactive oxygen species (ROS) generation. These mutations, particularly in the TP53, PTCH1, and CDKN2A genes, underlie the transformation of keratinocytes and melanocytes into malignant phenotypes. Epidemiologic data indicate a rising incidence of cutaneous melanoma and NMSC in areas experiencing increased UV indices. Parker (2021) documented rising skin cancer rates among lightly pigmented individuals in North America, especially those with Fitzpatrick skin types I–III, who possess minimal natural photoprotection due to lower melanin density [12]. Umar and Tasduq (2022) highlight that even populations with greater melanin pigmentation are not immune, particularly when socioeconomic barriers impede access to care [27].

Pediatric Photodermatoses and Early-Life Vulnerability

Pediatric populations are particularly vulnerable to UV radiation. As Schachtel et al. (2021) emphasize, the immaturity of the epidermal barrier and incomplete development of DNA repair mechanisms in children render them more susceptible to actinic erythema and photodamage [5]. Moreover, blistering sunburns in childhood are strongly associated with an increased lifetime risk of melanoma. The American Academy of Dermatology (AAD) recommends early-life sun avoidance, but climate change threatens to increase unintentional UV exposure due to longer and hotter summers, increased UV index values, and reduced availability of shaded play environments. In addition to physiological factors, pediatric sun exposure is highly dependent on guardian behavior, emphasizing the importance of climate literacy among caregivers, school systems, and community health programs. Schachtel & Boos (2019) advocate for pediatric dermatologists to serve as public health advocates in this regard [28].

The Photoprotection–Vitamin D Paradox

A final consideration is the ongoing debate surrounding photoprotection versus vitamin D sufficiency. While aggressive sun avoidance reduces skin cancer risk, it may also contribute to hypovitaminosis D, particularly in higher latitudes, during winter months, or among melanized skin phenotypes. Umar and Tasduq (2022) recommend an individualized approach: promoting broad-spectrum sunscreen use, protective clothing, and supplementation when necessary, particularly in pediatric, elderly, or institutionalized populations [27].

Wildfires, Air Pollution, and Cutaneous Health

Wildfires, once considered primarily environmental disasters, are now a recognized driver of dermatologic morbidity in the era of climate change. Intensified by drought, deforestation, rising temperatures, and land mismanagement, wildfires have increased in frequency, duration, and severity throughout the Americas. The resulting air pollution, composed of particulate matter, carbon monoxide (CO), nitrogen oxides, polycyclic aromatic hydrocarbons (PAHs), and volatile organic compounds (VOCs), has well-documented respiratory effects. However, its cutaneous consequences are emerging as a critical concern for dermatologists.

Table 4: Wildfire Pollutants and Associated Dermatologic Conditions.

Pollutant	Source During Wildfires	Associated Dermatologic Effects
PM2.5 (Fine Particulate Matter)	Combustion of wood, vegetation	Atopic dermatitis flares, pruritus, barrier disruption
Carbon Monoxide (CO)	Incomplete combustion of biomass	Irritant dermatitis, oxidative stress-related inflammation
Nitrogen Oxides (NOx)	Burning nitrogen-rich materials	Exacerbation of eczema, allergic contact dermatitis

Polycyclic Aromatic Hydrocarbons (PAHs)	Incomplete combustion of organic matter	AhR activation → pruritus, eczema, immune dysregulation
Volatile Organic Compounds (VOCs)	Evaporation and combustion of fuels/resins	Sensory irritation, contact dermatitis
Formaldehyde	Smoke degradation of organic matter	Mucocutaneous irritation, erythema
Ozone (O_3, secondary pollutant)	Atmospheric reaction of NOx + VOCs	Photosensitivity reactions, exacerbation of polymorphous light eruption (PMLE)

The Dermatologic Effects of Wildfire Smoke Exposure

Fine particulate matter (PM2.5), generated in large quantities during wildfire events, can penetrate the stratum corneum, disrupt the epidermal barrier, and trigger inflammatory skin responses. Fadadu et al. (2021), in a retrospective cohort analysis in California following the 2018 Camp Fire, found significant increases in healthcare utilization for atopic dermatitis (AD) and itch during wildfire episodes [1]. Similarly, Mangual et al. (2023) reported clinic visit spikes for eczema and pruritic conditions among urban Boston residents exposed to post-wildfire CO and PM2.5 concentrations [29]. Experimental studies support these observations: Hidaka et al. (2016) demonstrated that PAH exposure activates the aryl hydrocarbon receptor (AhR) pathway, leading to artemin overexpression and subsequent pruritus, epidermal barrier breakdown, and Th2 skewing key components of the atopic march [8]. These findings suggest a molecular mechanism linking wildfire pollutants to allergic and eczematous dermatoses, especially in pediatric and atopic populations.

Pediatric Vulnerability and Psychodermatoses

Children are particularly susceptible to the dermatologic impacts of wildfire-related pollution. As highlighted by Schachtel et al. (2019), the immature epidermis, higher surface area-to-body mass ratio, and immature detoxification systems in children exacerbate the cutaneous uptake of airborne toxins [28]. Wildfire-related stress has also been associated with flare-ups of chronic inflammatory dermatoses such as AD and psycho-dermatologic manifestations, including trichotillomania and exacerbation of psoriasis. In areas with prolonged wildfire seasons, such as California, Oregon, and western Canada, the compounded effects of pollution, heat, displacement, and stress may lead to a synergistic worsening of pediatric skin health, particularly among low-income families and rural communities with limited access to specialized dermatologic care.

Geographic Risk Zones and Fire Projection Models

Flannigan et al. (2005) and Goss et al. (2020) utilized predictive models indicating a projected 74–118% increase in wildfire area burned in Canada and the western United States by 2100 under current warming trajectories [6, 30]. These models highlight new regions of environmental dermatology risk as fire seasons expand into spring and autumn, traditionally lower-risk seasons for outdoor UV exposure, now increasingly linked with pollution-induced dermatoses [31]. Spracklen et al. (2009) further estimated that wildfire-related carbonaceous aerosol concentrations may increase by 40–95% over the next century in North America, with Western U.S. hotspots contributing heavily to the burden of smoke-related health outcomes [32].

Indoor Air Quality, Health Inequities, and Clinical Implications

The effects of wildfire pollution are disproportionately borne by rural, marginalized, and Indigenous populations. These groups often lack access to air filtration systems, live in substandard housing, and are more likely to experience prolonged indoor air pollution exposure during wildfire events. Dermatologic implications include exacerbation of chronic dermatoses, allergic contact dermatitis due to indoor smoke irritants, and delayed treatment due to infrastructure disruptions. Fathy & Rosenbach (2020) and Rosenbach (2019) call for dermatologists to incorporate environmental exposure histories into inpatient and outpatient assessments, especially during fire season [3, 10]. Dermatology practices should also be equipped to counsel patients on smoke mitigation strategies, including the use of HEPA filters, barrier creams, and emollient therapy to restore the stratum corneum.

Pediatric Vulnerability to Climate-Related Skin Disease

Children represent a uniquely susceptible population when it comes to the dermatologic consequences of climate change. Due to their developing immune systems, immature epidermal barriers, and greater surface area-to-body weight ratios, pediatric patients are particularly vulnerable to thermal stress, airborne pollutants, UV exposure, and vector-borne infections. Moreover, pediatric populations often lack autonomy in exposure behaviors, relying on caregivers and institutional environments to mitigate risk. These factors compound to make climate-sensitive skin disease in children both prevalent and under-recognized in dermatologic practice.

Table 5: Climate-Linked Pediatric Dermatoses by Exposure Type.

Exposure Type	Dermatoses in Pediatric Population
Wildfire Smoke (PM2.5, CO, PAHs)	Atopic dermatitis flares, pruritus, irritant dermatitis
UV Radiation & Ozone Depletion	Sunburn, photodamage, increased melanoma risk
Extreme Heat	Miliaria, heat rash, exacerbation of eczema
Vector-Borne Exposure (Ticks, Mosquitoes, etc.)	Exanthems, vesiculopapular rashes (Lyme, Zika, Leishmaniasis)
Flooding & Displacement	Scabies, impetigo, dermatophytoses, nutritional dermatoses

Pollution (NO_2, SO_2, VOCs)	Chronic eczema, barrier disruption, allergic contact dermatitis
Climate-Linked Migration	Infestations (cutaneous larva migrans, lice), myiasis, refugee camp-related infections

Immature Cutaneous Defenses and Pollution Sensitivity

The pediatric epidermis, especially in infants and toddlers, is thinner and has a less efficient stratum corneum, making it more permeable to PM2.5, VOCs, and ozone. Several studies have drawn a connection between wildfire pollution and pediatric eczema flares, including Fadadu et al. (2021) and Mangual et al. (2023), both of which documented increases in AD-related healthcare utilization following smoke exposure events [1, 29]. Kim (2015) and Kathuria & Silverberg (2016) demonstrated that ambient air pollutants including NO_2, SO_2, and heavy metals disproportionately affect urban pediatric popu-lations, with a significant association between pollutant exposure and atopic dermatitis (AD) prevalence and severity [32, 33]. This risk is exacerbated in children with genetic skin barrier defects (e.g., filaggrin mutations) and those residing in low-income or poorly ventilated environments.

UV Exposure and Pediatric Photodamage

Children have limited behavioral control over sun exposure and rely on adults for the implementation of sun-safe practices. Schachtel et al. (2021) and Parker (2021) emphasized that climate change increases the duration and intensity of UV exposure, leading to higher rates of sunburn, photoaging, and, later in life, melanoma risk [5, 12]. Early-life blistering sunburns have a well-established correlation with cutaneous malignant melanoma, especially in children with Fitzpatrick skin types I–II. Neale et al. (2023) suggested that while public health interventions like the Montreal Protocol have reduced extreme UV events, changing outdoor behavior patterns and reduced green canopy coverage in schools and parks may lead to greater unintentional pediatric exposure [4].

Vector-Borne Infections in Children

As documented in Rosenberg et al. (2018), climate-driven changes in tick and mosquito habitats have led to increasing pediatric incidence of diseases such as Lyme disease, Zika virus, and dengue fever, many of which present with exanthematous or vesiculopapular eruptions [7]. Children may present with atypical or more florid dermatologic manifestations, and delays in diagnosis can result from limited access to pediatric dermatologists in rural or underserved areas. Schachtel & Boos (2019) and Dinulos et al. (2023) highlighted that climate-linked refugee crises and global travel have also resulted in increased incidence of parasitic and tropical dermatoses in pediatric populations, in-cluding scabies, cutaneous larva migrans (CLM), leishmaniasis, and myiasis [21, 28].

Table 6: Common Dermatologic Diagnoses in Displaced Populations Across the Americas

Region of Displacement (Americas)	Common Dermatologic Diagnoses
Central America & Mexico	Scabies, impetigo, cutaneous larva migrans (CLM), tinea corporis, cutaneous leishmaniasis
Northern Triangle Migrants (El Salvador, Guatemala, Honduras)	Pediculosis, bacterial infections, heat rash, fungal infections
Caribbean (Haiti, Puerto Rico, Cuba)	Atopic dermatitis (AD) flares, irritant dermatitis, fungal infections post-hurricane
Southern U.S. (Gulf Coast, Texas, Florida)	Scabies, impetigo, AD, dermatophytoses in flood shelters
Southwestern U.S. & Northern Mexico	Cutaneous leishmaniasis, actinic damage, xerosis, CLM
Amazon Basin (Brazil, Peru, Colombia)	Mycoses (e.g., chromoblastomycosis, sporotrichosis), insect-bite hypersensitivity reactions
Andean Highlands (Peru, Bolivia, Ecuador)	UV-induced dermatoses, xerosis, high-altitude erythema

Psychodermatologic and Displacement-Related Impacts

Climate-related displacement, disasters, and food insecurity all disproportionately affect children. Kwak et al. (2021) and Dayrit et al. (2018) noted that internally displaced and refugee children are more likely to develop infestations, infectious dermatoses, and nutritional skin disorders [9,11]. These children also face limited sanitation, inadequate hygiene infrastructure, and scarce dermatologic care, compounding their skin vulnerability. Emerging data suggest that pediatric patients exposed to natural disasters, wildfire evacuations, or environmental stressors are also at increased risk of psychodermatologic conditions, such as trichotillomania, stress-exacerbated AD, and juvenile psoriasis [5]. These conditions often go underdiagnosed due to the prioritization of acute health issues in post-disaster settings.

Climate Migration and Displacement: Cutaneous Impacts in Mobile Populations

Climate change is one of the most significant drivers of human migration in the 21st century, with increasing frequency and severity of droughts, floods, wildfires, and heatwaves forcing both internal and cross-border displacement. By 2050, over 216 million people may be displaced by climate-related stressors, according to the World Bank [34]. These migratory events profoundly affect skin health due to overcrowding, poor sanitation, inadequate medical infrastructure, and exposure to novel pathogens (Table 6). Dermatologists must recognize the expanding burden of climate-linked dermatoses in mobile and refugee populations and adapt care practices accordingly.

Displacement-Associated Skin Diseases

Forced migration is associated with a high incidence of infestations, infectious dermatoses, and inflammatory conditions, particularly among displaced children. Kwak et al. (2021) highlighted the dermatologic challenges in climate refugees and internally displaced persons (IDPs) from the Americas [11]. Common dermatoses included scabies, pediculosis, impetigo, tinea corporis, and ectoparasitic infestations such as CLM and myiasis, frequently exacerbated by overcrowded shelters and lack of access to clean water. Dayrit et al. (2018) and Dinulos et al. (2023) further emphasized that post-disaster environments (e.g., flood zones and temporary encampments) result in dramatic increases in secondary bacterial infections, dermatophytoses, and contact dermatitis due to compromised hygiene and limited topical therapies [9, 21]. These risks are amplified when affected individuals are exposed to unfamiliar climates, vectors, and allergens, contributing to diagnostic delays and treatment challenges.

Tropical and Vector-Borne Dermatoses in Non-Endemic Regions

Displaced individuals frequently introduce tropical vector-borne dermatoses into regions where physicians may lack diagnostic familiarity. Dinulos et. al. (2023) and McIlwee et al. (2018) report increasing cases of cutaneous leishmaniasis (CLM), Chagas disease, and myiasis among migrants, refugees, and international travelers, with a growing proportion of patients having no travel history [19, 21]. This underscores the geographic expansion of vectors and climate-driven risk redistribution. Peterson & Shaw (2003) and González-Rosas et al. (2010) used ecological models to demonstrate that sandfly vectors of leishmaniasis are expanding their range northward, increasing the risk of endemic cases in the southern United States and Mexico [17, 18]. In this context, dermatologists must be aware of imported infections, atypical presentations, and the sociocultural barriers to accessing care in migrant populations.

Psychodermatologic Burden of Displacement

Displacement often involves profound psychological trauma, including loss of home, violence, separation from family, and uncertainty about the future. These stressors contribute to psychodermatoses, such as trichotillomania, neurotic excoriations, stress-exacerbated atopic dermatitis, and psoriasis flares. Schachtel et al. (2021) and Schachtel & Boos (2019) called for greater mental health integration in climate-related dermatology, especially among pediatric patients and adolescents [5, 28]. The invisibility of skin disease in humanitarian settings further exacerbates suffering. Skin conditions are often perceived as cosmetic or low priority, despite their links to pain, stigma, and systemic infection risks [5]. Advocacy groups and humanitarian organizations must integrate dermatologic screening, treatment kits, and culturally sensitive educational materials into disaster response protocols.

Structural Barriers to Dermatologic Care

Undocumented and displaced populations face a host of systemic barriers to dermatologic care, including lack of health insurance, language obstacles, legal vulnerabilities, and medical bias. Fathy & Rosenbach (2020) and Rosenbach (2019) emphasized the need for inclusive dermatologic education and training, as well as increased access to teledermatology, community outreach clinics, and mobile medical units in underserved and migrant-dense areas [3, 10]. Moreover, climate migration is not always sudden or crisis-driven. Slow-onset displacement (e.g., sea level rise or desertification) often receives less attention, despite its strong links to chronic skin disease burdens, including xerosis, photodermatoses, and environmentally triggered eczemas. Addressing these long-term changes requires a paradigm shift in dermatologic public health planning.

Table 7: Climate-Adaptive Dermatologic Policy Actions and Target Populations

Policy Action	Target Populations
Integrate climate risk mapping into dermatology workforce planning	Rural agricultural workers, border regions, Indigenous communities
Expand dermatology access through teledermatology and mobile clinics	Underserved rural and urban populations, displaced individuals
Mandate climate-health education in dermatology training	Dermatology residents, medical students, continuing medical education participants
Establish dermatologic registries for climate-exposed populations	Children, migrants, outdoor laborers, wildfire survivors
Distribute sunscreen, barrier creams, and hygiene kits post-disaster	Hurricane evacuees, flood victims, internally displaced persons (IDPs), refugee camps
Prioritize climate-related dermatoses in public health funding	Low-income communities, climate refugees, uninsured populations
Include dermatology in disaster preparedness and refugee health protocols	Displaced persons, emergency responders, humanitarian field clinics

Discussion

The preceding sections demonstrate how climate change amplifies the burden of dermatologic disease across the Americas through environmental exposure, geographic vector shifts, pediatric sensitivity, and forced migration. These impacts are not evenly distributed. They intersect with longstanding structural inequities in healthcare access, socioeconomic status, race and ethnicity, geographic isolation, and political marginalization. As climate-related dermatoses increase in scope and complexity, dermatologists are uniquely positioned to serve as both clinicians and advocates.

Health Equity and Climate Justice

The dermatologic consequences of climate change disproportionately affect Indigenous communities, rural agricultural workers, children, low-income migrants, and communities of color, who are more likely to live in high-exposure zones with limited access to specialty care. For example, farmworkers in the U.S. Southwest, many of whom are Latinx and undocumented, face cumulative UV radiation, pesticide contact, and poor access to photoprotection and screening, contributing to rising rates of actinic keratoses and nonmelanoma skin cancers [35]. Similarly, children in urban public housing are more exposed to airborne pollutants and indoor mold, worsening atopic dermatitis outcomes [36]. Rosenbach (2019) and Fathy & Rosenbach (2020) emphasize that dermatology must adopt a climate justice framework, recognizing that the ability to prevent or manage environmentally driven dermatoses is unequally distributed [3, 10]. This means prioritizing vulnerable populations in research, clinical outreach, and education.

Workforce Preparedness and Education

Climate-linked dermatoses, including vector-borne infections, wildfire-related inflammatory conditions, and post-disaster infestations, are underrepresented in current dermatology training. Kwak et al. (2021) and Schachtel & Boos (2019) call for dermatology residency programs to incorporate climate health education, global dermatology modules, and environmental dermatopathology into standard curricula [11, 28]. Clinicians in high-risk zones, such as the U.S.-Mexico border, Caribbean islands, and fire-prone western states, must be prepared to diagnose and treat conditions like leishmaniasis, CLM, smoke-induced prurigo, and mycoses, conditions that were previously considered rare or "tropical." Professional organizations, such as the American Academy of Dermatology (AAD), have begun issuing climate change policy statements, but institutional support must be paired with funded training, clinical algorithms, and community partnerships to be effective [37].

Teledermatology and Innovations in Access

One promising mitigation strategy is teledermatology, which has shown success in reaching rural and displaced populations during both pandemic-related lockdowns and natural disasters. The expansion of store-and-forward imaging, mobile apps, and cross-border provider networks has enabled more equitable triage and care delivery, especially for conditions requiring visual diagnosis. Fadadu et al. (2021) and Coates & Norton (2020) both emphasize that teledermatology should not be treated as a stopgap, but rather a core pillar of climate-adaptive care models [1,23]. Funding, training, and legal frameworks must evolve to ensure cross-state and international use, especially in disaster response and refugee care.

Policy Recommendations Based on this review, we recommend the following policy and practice initiatives to address the dermatologic dimensions of climate change

1) Integrate climate risk mapping with dermatology workforce planning to deploy resources in high-exposure regions.
2) Expand dermatology access in underserved and rural areas via telehealth, mobile clinics, and targeted residency pipelines.
3) Mandate climate education and vector-borne disease training in dermatology residency and continuing medical education (CME).
4) Fund climate-health surveillance programs, including environmental dermatology registries for tracking exposure-driven dermatoses.
5) Prioritize public health partnerships to distribute sunscreen, barrier creams, and hygiene kits to vulnerable populations post-disaster.
6) Center affected communities in research funding and study design to address environmental racism and structural barriers to care.

Future Directions

More research is needed to characterize longitudinal dermatologic outcomes in climate refugees, the efficacy of topical interventions in polluted or wildfire-prone areas, molecular and immunologic responses to emerging environmental triggers, and regional differences in access to skin cancer prevention resources. This review underscores that the future of dermatology must be climate-informed, equity-focused, and prevention-driven. Dermatologists are at the frontline of visible climate impacts and must be supported as key players in climate adaptation planning.

Conclusion

The escalating climate crisis is transforming the landscape of dermatologic disease across the Americas. As temperatures rise, precipitation patterns shift, and extreme weather events grow more frequent, the skin, which serves as the body's first line of defense, is increasingly challenged by environmental exposures. This review synthesizes the growing body of evidence demonstrating how climate change is altering the epidemiology, severity, and geographic distribution of skin diseases. These changes carry significant implications for clinical dermatology, public health, and healthcare equity. Vector-borne dermatoses such as cutaneous leishmaniasis, Lyme disease, and arboviral exanthems are emerging in regions previously considered non-endemic. This trend is largely driven by the northward expansion of sandfly, mosquito, and tick habitats. At the same time, rising UV exposure, influenced by ozone depletion and behavioral shifts, has contributed to the increased incidence of skin cancers. These effects are especially pronounced among outdoor laborers and rural populations who often lack access to photoprotection, screening, or specialty care. Wildfire-related pollution, including PM2.5 and VOCs, has been linked to flares of inflammatory skin conditions such as atopic dermatitis and prurigo, particularly in pediatric and immunologically vulnerable individuals. In addition to these biological effects, climate change also acts as a social determinant of skin health. Displacement, forced migration, and housing instability, often resulting from climate-related disasters and chronic environmental stress, contribute to a high burden of infectious dermatoses, infestations, and psychodermatologic conditions in mobile and refugee populations. Children are particularly vulnerable due to their immature skin barrier, higher surface area-to-weight ratio, and reliance on adult caregivers for hygiene, photoprotection, and medical access. In response to these emerging threats, dermatology must adopt a climate-responsive framework. Key components of this approach should include:

1. Training clinicians to recognize and manage environmentally mediated dermatoses, including tropical infections, pollutant-related conditions, and disaster-associated skin disorders.
2. Expanding access to care through teledermatology platforms, mobile clinics, and outreach initiatives that serve rural and climate-impacted communities.
3. Ensuring equitable distribution of resources such as sunscreen, barrier creams, hygiene supplies, and culturally appropriate health education materials in disaster and displacement settings.
4. Developing dermatologic registries and climate-health surveillance systems that can monitor shifting disease trends and support targeted interventions.
5. Advocating for dermatology's integration into national climate preparedness planning, global health strategies, and public health policy frameworks.

The responsibilities of dermatologists extend beyond diagnosis and treatment. As specialists uniquely positioned to observe the visible manifestations of environmental change, dermatologists have a crucial role in advancing clinical preparedness, research, and systemic adaptation efforts. Dermatologic conditions serve not only as markers of individual disease but also as indicators of environmental injustice and structural vulnerability. Achieving a resilient and equitable future for skin health in the Americas will require broad collaboration. Dermatologists must work closely with epidemiologists, environmental scientists, public health officials, and policymakers. This interdisciplinary approach will help ensure that the specialty remains central to both clinical care and climate adaptation strategies. The skin is a sentinel organ and, in many cases, the first to signal environmental disruption. Recognizing and acting on these signals is both a clinical responsibility and a public health imperative.

Inclusion in Global Research Statement

Inclusion in Global Research Statement: This review did not involve primary data collection or fieldwork requiring permits, community authorization, or collaborations with local authorities. However, we acknowledge the contributions of researchers and communities across the Americas whose published data and insights formed the foundation of this review. We support the principles of equity, transparency, and ethical collaboration outlined in the TRUST Code and AGU's Inclusion in Global Research policy and remain committed to inclusive, community-centered research in future projects.

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Open Research

The full reference library used for literature extraction and evidence synthesis in this review has been archived at Zenodo under the Creative Commons Attribution license (CC BY 4.0). The Zotero-exported BibTeX file includes peer-reviewed articles, public health data, and climate-dermatology sources analyzed between 2000–2025. The reference file is publicly available at https://doi.org/10.5281/zenodo.15200134.
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