AMERICAN COLLEGE OF RHEUMATOLOGY

POSITION STATEMENT

SUBJECT:	Environmental Health and Rheumatic Disease
PRESENTED BY:	Committee on Rheumatologic Care
FOR DISTRIBUTION TO:	Members of the American College of Rheumatology United States Congress Department of Health and Human Services Medical Specialty Societies

POSITIONS:

1. The American College of Rheumatology (ACR) acknowledges the significant impact of environmental factors on human health and supports policies that address the disproportionate impact of environmental exposures on vulnerable populations, including those living with rheumatic diseases.
2. The ACR aims to assess the needs of the rheumatology community as it relates to the potential impacts of the environment on rheumatic disease patients and healthcare systems.
3. The ACR supports continued research to identify existing gaps within the field of rheumatology as they relate to environmental impacts on human health and rheumatic disease diagnosis, treatment and outcomes and integrating these findings into medical curriculum and continuing education resources.
4. Rheumatologists and rheumatology health professionals are encouraged to become educated about the relationship between environmental factors and human health, particularly as it pertains to the onset, progression, and management of rheumatic diseases.
5. The ACR encourages hospitals and health care systems to adopt sustainable infrastructure and resource conservation to decrease the environmental impact of the practice of medicine.

BACKGROUND:

Individuals with chronic rheumatic disease are increasingly vulnerable to the effects of changes to the earth's climate and extreme weather events. Rheumatologists and allied rheumatology

health professionals witness these impacts in the clinic. Fluctuations in air quality and temperature can intensify rheumatic disease symptoms, increasing the risk of disease flares or hospitalization (1). Extreme weather events may disrupt healthcare infrastructure, affecting patient access to timely care and treatment.

The American College of Rheumatology (ACR) agrees with the broad scientific consensus that long-term shifts in global temperature and weather patterns are driven by increased concentration of heat-trapping greenhouse gases in the atmosphere (2). The 10 warmest years on record have occurred in the last decade, with 2024 as the planet's warmest (3). The shift in global temperature correlates with increased prevalence of severe weather events, with 27 climate related disasters in the United States cumulating in over $1 billion in damages in 2024 (4).

As climate-related events grow more frequent, the burden of rheumatic disease continues to grow. As the nation's leading cause of disability, arthritis affects approximately 60 million adults nationwide, or one in four Americans (5). An additional 300,000 children in the United States are diagnosed with juvenile arthritis (6). The widespread reach of rheumatic disease set against the backdrop of an increasingly unstable global climate underscores the need to understand how environmental stressors affect health outcomes for rheumatic disease patients.

Manifestations of Environmental Hazards with Potential Impacts on the Health of Rheumatic Disease Patients:

The adverse effects of climate variability will disproportionately impact vulnerable populations, particularly those who have been historically, economically, and socially marginalized. These social determinants are well-documented contributing factors to racial and ethnic disparities in rheumatic disease, as socioeconomic status has been associated with worsened health outcomes in systemic lupus erythematosus and rheumatoid arthritis (7-9). Like other determinants of health, the intersection of environmental stressors and existing social vulnerability has been shown to affect health outcomes. Rheumatic disease patients living in areas with greater social vulnerability have an increased risk of recurrent hospitalization due to extreme heat events (10). In addition to exacerbating disease burden in vulnerable populations, environmental stressors contribute to increased health care utilization and associated costs attributed to hospitalization.

Shifts in global climate lead to diminished air quality; extreme weather and temperature events; an increased prevalence of wildfires and floods; agricultural disruptions; and a greater burden of infectious diseases, all of which have complex and layered effects on human health. Climate variability's impact on rheumatic disease is best understood by looking at how specific manifestations of environmental instability affect rheumatic disease patients.

Air Quality & Exposure to Pollutants:

Along with ultraviolet (UV) radiation, air pollution is one of the best studied environmental factors regarding its impact on rheumatic diseases. Air pollution can induce systemic inflammatory responses via a variety of mechanisms and has been identified as a potential risk factor for the development of rheumatic disease (11). Additional studies have shown an association of pollution with the incidence and activity of RA, SLE and Sjogren's, as well as an increase in gout flares (12-20).

More extreme wet and dry cycles are correlated with an increased risk of large wildfires in the western United States and Canada (21). Wildfires are associated with the release of PM2.5 containing sulfates, nitrates, black carbon and silica (22) which are ten times more toxic than background PM (23). Additional research is needed to specifically address the impact of exposure to wildfire smoke on patients with rheumatic diseases.

A variety of other environmental toxins may also have a negative impact on rheumatic diseases – including pesticides, persistent organic pollutants, endocrine-disrupting chemicals and nano plastics (24-31). Use of certain pesticides may increase antifungal drug resistance, increasing the morbidity and mortality of fungal infections in the immunosuppressed. (32).

Extreme Weather:

The increase in sea surface temperatures has been associated with increased hurricane activity and a higher proportion of stronger Category 4-5 hurricanes (Lapointe). Fragile patients with rheumatic diseases, particularly those dependent on immunosuppressive medications, may experience reduced access to health care and medications due to hospital and practice closures, pharmacy supply chain issues, lack of refrigeration due to power loss, and displacement from homes with evacuations due to hurricanes (34-35). In the wake of hurricane Ida, rheumatologists reported the loss of $450,000 worth of infusible medications due to power outage disrupting the refrigeration of perishable biologics (36). Patients encountered delays in infusion administration and care as appointments were rescheduled to account for clinic closure during the storm.

Extreme Temperature:

Heat waves can lead to heat illness in susceptible patients, with higher mortality rates in the elderly and in those with heart disease or lung disease (37-39). Rheumatic disease patients with cardiac and pulmonary complications may have an increased risk of injury during a heat wave. Heat waves have also been associated with an increase in admissions for kidney disease and an increased rate of acute kidney failure (40). Extreme heat could put patients with systemic lupus erythematosus and some types of vasculitis at greater risk for hospitalization, given the common occurrence of kidney disease with these conditions (41).

Some regions in the U.S. have experienced more extreme cold events related to disruptions in the polar jet stream due to changes in atmospheric weather patterns (42). Extreme cold events can

negatively impact patients with Raynaud's phenomenon. Symptoms for these patients can be particularly worsened in temperatures below 20 °F (43). Patients with rheumatoid arthritis may experience flares of joint pain and swelling in colder weather, at times leading to increased hospital admissions (44). Studies have also shown an increase in outpatient visits by Sjogren's patients and increased joint pain with a variety of arthritic conditions during cold weather (45).

Extreme weather events have been shown to produce negative mental health outcomes including anxiety, acute stress reactions and post-traumatic stress disorders, sleep disruption and suicidal ideation. Those with low socioeconomic status and less access to services are especially vulnerable (46). Though no studies to date have focused on the mental stress associated with environmental stressors and rheumatic diseases, research has demonstrated that autoimmune diseases can be triggered by or exacerbated with mental stress (42-43). The adverse effects will disproportionately impact vulnerable populations, including racial and ethnic minority groups that tend to fare worse with their rheumatic diseases (47-48).

Vector-borne illness:

There are a variety of infections with arthritic manifestations that are spread by mosquitoes and tick vectors. Increasing precipitation and temperatures have altered the seasonal growth patterns and habitat ranges of these vectors. Optimal weather conditions for "mosquito days" have increased up to two weeks with warmer weather in most of the contiguous United States (49). Infectious agents with arthritic manifestations are expected to increase in range in North America in the coming decades, including dengue, chikungunya and Lyme disease (50-55).

Disruptions in Global Food Supply Chain

Extreme weather events, drought, changes in soil fertility, and decreasing crop yields and bioavailability of nutrients in foods are projected to increase malnutrition and food insecurity (56). While no studies directly evaluate the impact of food insecurity on patients with rheumatic diseases, there is evidence of increased severity of RA and SLE in the context of nutritional impairment (57-59). Several studies have also demonstrated an association between malnutrition and systemic involvement in scleroderma, including skin, pulmonary, and gastrointestinal manifestations (60).

Sustainable Practice of Medicine:

Energy Use:

The health care sector is the second most energy-intensive industry, surpassed only by food production. Hospitals and health systems spend $9 billion annually on energy costs, while also producing approximately 2.3 million tons of waste per year (61). The report "Addressing Climate Change in the Health Care Setting: Opportunities for Action," published by Healthcare Without Harm and Practice Greenhealth, recommends strategies to foster environmental stewardship within the healthcare sector at both the individual and the system level (62).

Hospitals and healthcare systems have the capacity to invest in green initiatives with a wide degree of impact, while clinicians and healthcare professionals may also be able to incorporate sustainability into daily practice.

Telemedicine:

The ACR recognizes that telemedicine is a tool that can increase access and improve outcomes for patients with rheumatic diseases when used as an adjunct to face-to-face assessments. Expanding the use of telemedicine can mitigate carbon emissions in outpatient medicine. A Stanford study found that a 36% drop in in-person outpatient visits due to telemedicine resulted in a reduction of 17,000 metric tons of greenhouse gases in 2021 (63). Additionally, extreme weather events such as wildfires, severe storms, or extreme temperatures may disrupt standard practice operations. Telemedicine may be used in these instances to maintain access to care in situations where it may otherwise be unsafe to travel, or in circumstances where a practice is damaged or evacuated due to environmental concerns or severe weather events. Environmental considerations of telemedicine, while significant, come secondary to the use of telemedicine as a critical tool to expand patient's access to care.

Education:

Created to serve the unique needs of the rheumatology community, ReactRheum engages the rheumatology workforce and patients in prioritizing sustainable, data-driven, and cost-effective rheumatology care and research (67). React Rheum compiles resources for both patients and care providers to navigate and understand the relationship between environmental health and rheumatic disease outcomes. Resources include fact sheets, events and webinars specific to rheumatology, and a collection of funding information for climate-informed rheumatology research.

CONCLUSION

The ACR recognizes environmental determinants of human health and the unique vulnerabilities faced by individuals living with rheumatic diseases. As shifting climate and weather patterns continue to alter the environment and access to essential resources, rheumatologists and rheumatology professionals must be prepared to address the evolving needs of their patients. The ACR supports policies that mitigate the disproportionate impact of environmental exposures on vulnerable populations and encourages hospitals and healthcare systems to adopt sustainable practices that reduce the environmental footprint of medical care. The ACR also affirms the importance of continued research to identify gaps in understanding the relationship between environmental factors and rheumatic disease outcomes, and advocates for the integration of these findings into medical education and continuing professional development. By prioritizing climate-informed care, investing in sustainable infrastructure, and supporting climate informed education and research, the rheumatology workforce can play a critical role in improving health outcomes.

REFERENCES:

1. American College of Rheumatology. Socioeconomic disparities and rheumatic disease outcomes. Arthritis Rheumatol. Published online 2024. https://doi.org/10.1002/art.42919

2. United Nations. What is climate change? United Nations website. https://www.un.org/en/climatechange/what-is-climate-change. Accessed 2025.

3. National Oceanic and Atmospheric Administration. 2024 was nation's warmest year on record. NOAA website. https://www.noaa.gov/news/2024-was-nations-warmest-year-on-record. Accessed 2025.

4. National Oceanic and Atmospheric Administration. 2024 was nation's warmest year on record. NOAA website. https://www.noaa.gov/news/2024-was-nations-warmest-year-on-record. Accessed 2025.

5. Arthritis Foundation. About arthritis. Arthritis Foundation website. https://www.arthritis.org/about-arthritis. Accessed 2025.

6. Arthritis Foundation. Juvenile arthritis. Arthritis Foundation website. https://www.arthritis.org/diseases/juvenile-arthritis. Accessed 2025.

7. Lotstein DS, Ward MM, Bush TM, Lambert RE, van Vollenhoven R, Neuwelt CM. Socioeconomic status and health in women with systemic lupus erythematosus. J Rheumatol. 1998;25:1720-1729.

8. Jacobi CE, Mol GD, Boshuizen HC, Rupp I, Dinant HJ, van den Bos GAM. Impact of socioeconomic status on the course of rheumatoid arthritis and related use of health care services. Arthritis Rheum. 2003;49:567-573. doi:10.1002/art.11200

9. Santacroce L, Yang S, Summit R, Valle A, Collins JE, Dellaripa PF, Feldman CH. Effects of social vulnerability and environmental burden on care fragmentation and social needs among individuals with rheumatic conditions. Arthritis Care Res (Hoboken). 2025;77(1):116-126. doi:10.1002/acr.25431

10. American College of Rheumatology. Environmental exposures and rheumatic disease. Arthritis Care Res (Hoboken). Published online. https://doi.org/10.1002/acr.25015

11. Sun G, Hazlewood G, Bernatsky S, Kaplan GG, Eksteen B, Barnabe C. Association between air pollution and the development of rheumatic disease: a systematic review. Int J Rheumatol. 2016;2016:5356307. doi:10.1155/2016/5356307

12. Chang KH, Hsu CC, Muo CH, Hsu CY, Liu HC, Kao CH, et al. Air pollution exposure increases the risk of rheumatoid arthritis: a longitudinal nationwide study. Environ Int. 2016;94:495-499. doi:10.1016/j.envint.2016.06.008

13. Adami G, Viapiana O, Rossini M, Orsolini G, Bertoldo E, Giollo A, et al. Association between environmental air pollution and rheumatoid arthritis flares. Rheumatology (Oxford). 2021;60:4591-4597. doi:10.1093/rheumatology/keab049

14. Xing M, Ma Y, Cui F, Li D, Wang J, Tang L, et al. Air pollution, genetic susceptibility, and risk of incident systemic lupus erythematosus. Arthritis Rheumatol. Published online July 10, 2024.

15. Bernatsky S, Fournier M, Pineau CA, Clarke AE, Vinet E, Smargiassi A. Associations between ambient fine particulate levels and disease activity in systemic lupus erythematosus. Environ Health Perspect. 2011;119:45-49. doi:10.1289/ehp.1002123

16. Jung CR, Chung WT, Chen WT, Lee RY, Hwang BF. Long-term exposure to traffic-related air pollution and systemic lupus erythematosus in Taiwan. Sci Total Environ. 2019;668:342-349. doi:10.1016/j.scitotenv.2019.03.018

17. Zhang TP, Wang LJ, Wang S, Wang P, Zhou XH, Wang L, et al. Exposure to ambient gaseous pollutants and hospitalizations for Sjögren syndrome. Front Immunol. 2022;13:1028893. doi:10.3389/fimmu.2022.1028893

18. Chen Y, He YS, Feng YT, Wu ZK, Wang J, Yin KJ, et al. Air pollution exposure and outpatient visits for Sjögren syndrome. Environ Res. 2022;214(Pt 3):114017.

19. Ryu HJ, Seo MR, Choi HJ, Cho J, Baek HJ. Particulate matter (PM10) as a risk factor for acute gout flares. Joint Bone Spine. 2021;88(2):105108. doi:10.1016/j.jbspin.2020.105108

20. He YS, Wang GH, Wu Q, Wu ZD, Chen Y, Tao JH, et al. Ambient air pollution and hospitalizations for gout. J Inflamm Res. 2021;14:5827-5835.

21. Spracklen DV, Mickley LJ, Logan JA, Hudman RC, Yevich R, Flannigan MD, et al. Impacts of climate change on wildfire activity and aerosols in the western United States. J Geophys Res. 2009;114:D20. doi:10.1029/2008JD010966

22. Kizer KW. Wildfire smoke pollution, climate change, and skin disease. JAMA Dermatol. 2021. doi:10.1001/jamadermatol.2021.0026

23. Fadadu RP, Solomon G, Balmes JR. Wildfires and human health. JAMA. 2024;332(12):1011-1012. doi:10.1001/jama.2024.13600

24. Miller FW. Environment, lifestyles, and climate change in autoimmune disease. Arthritis Care Res (Hoboken). 2024. doi:10.1002/acr.25423

25. Parks CG, Hoppin JA, De Roos AJ, et al. Rheumatoid arthritis and pesticide exposure. Environ Health Perspect. 2016;124:1728-1734. doi:10.1289/ehp129

26. Williams JN, Chang SC, Sinnette C, et al. Pesticide exposure and systemic lupus erythematosus. Lupus. 2018;27:2129-2134. doi:10.1177/0961203318805844

27. Abella V, Pérez T, Scotece M, et al. Pollutants and rheumatic diseases. Life Sci. 2016;157:140-144. doi:10.1016/j.lfs.2016.06.010

28. Lee DH, Steffes M, Jacobs DR. Serum PCBs and arthritis risk. Environ Health Perspect. 2007;115:883-888. doi:10.1289/ehp.9887

29. Tsai PC, Ko YC, Huang W, et al. PCB exposure and lupus mortality. Sci Total Environ. 2007;374:216-222. doi:10.1016/j.scitotenv.2006.12.024

30. Chen L, Sun Q, Peng S, et al. Heavy metals and rheumatoid arthritis risk. Chemosphere. 2022;289:133147. doi:10.1016/j.chemosphere.2021.133147

31. Jiang B, Kauffman A, Li L, et al. Health impacts of micro- and nanoplastics. Environ Health Prev Med. 2020;25:29. doi:10.1186/s12199-020-00870-9

32. New England Journal of Medicine. Climate change and health equity. N Engl J Med. Published online. https://doi.org/10.1056/NEJMp2416548

33. Lapointe F, Bradley RS, Francus P, Balascio NL, Abbott MB, Stoner JS, et al. Annually resolved Atlantic sea surface temperature variability over the past 2,900 y. Proc Natl Acad Sci USA 2020;117,27171-27178. *https://doi.org/10.1073/pnas.2014166117*

34. Redlener I, Reilly MJ. Lessons from Hurricane Sandy. N Engl J Med. 2012;367:2269-2271. doi:10.1056/NEJMp1213486

35. Sharpe JD, Clennon JA. Pharmacy functionality during Hurricane Florence. Disaster Med Public Health Prep. 2020;14:93-102. doi:10.1017/dmp.2019.114

36. The Rheumatologist. Rheumatologists share lessons learned after Hurricane Ida. https://www.the-rheumatologist.org/article/rheumatologists-share-lessons-learned-in-the-wake-of-hurricane-ida/. Accessed 2025.

37. Raymond C, Matthews T, Horton RM. Heat and humidity limits to human tolerance. Sci Adv. 2020;6:eaaw1838. doi:10.1126/sciadv.aaw1838

38. Epstein Y, Yanovich R. Heatstroke. N Engl J Med. 2019;380:2449-2459. doi:10.1056/NEJMra1810762

39. Howard JT, Androne N, Alcover KC, Santos-Lozada AR. Heat-related deaths in the US. JAMA. 2024;332(14):1203-1204. doi:10.1001/jama.2024.16386

40. Hansen AL, Bi P, Ryan P, et al. Heat waves and renal admissions. Int J Epidemiol. 2008;37:1359-1365. doi:10.1093/ije/dyn165

41. Anders HJ, Vielhauer V. Renal comorbidity in rheumatic disease. Arthritis Res Ther. 2011;13:222. doi:10.1186/ar3256

42. Cohen J, Agel L, Barlow M, et al. Arctic variability and US winter weather. Science. 2021;373:1116-1121. doi:10.1126/science.abi9167

43. Virgili-Gervais G, Matthews B, Nassar EL, et al. Temperature and Raynaud phenomenon severity. Lancet Rheumatol. 2024;6:e684-e692. doi:10.1016/S2665-9913(24)00189-9

44. Azzouzi H, Ichchou L. Seasonal effects on rheumatoid arthritis. Pain Res Manag. 2020;2020:5763080. doi:10.1155/2020/5763080

45. Ziadé N, Bouzamel M, Mrad-Nakhlé M, et al. Weather, pollution, and joint pain. Clin Rheumatol. 2021;40:3929-3940. doi:10.1007/s10067-021-05735-2

46. Hayes K, Blashki G, Wiseman J, Burke S, Reifels L. Climate change and mental health. Int J Ment Health Syst. 2018;12:28. doi:10.1186/s13033-018-0210-6

47. de Brouwer SJ, Kraaimaat FW, Sweep FC, et al. Experimental stress in inflammatory rheumatic diseases. Arthritis Res Ther. 2010;12:R89. doi:10.1186/ar3016

48. Song H, Fang F, Tomasson G, et al. Stress-related disorders and autoimmune disease. JAMA. 2018;319:2388-2400. doi:10.1001/jama.2018.7028

49. Stevens H. Where mosquito season is getting longer. Washington Post. August 22, 2024. Accessed 2025.

50. Liu-Helmersson J, Stenlund H, Wilder-Smith A, Rocklöv J. Vectorial capacity of Aedes aegypti. PLoS One. 2014;9:e89783. doi:10.1371/journal.pone.0089783

51. Messina JP, Brady OJ, Golding N, et al. Global dengue distribution. Nat Microbiol. 2019;4:1508-1515. doi:10.1038/s41564-019-0476-8

52. Tjaden NB, Suk JE, Fischer D, et al. Climate change and chikungunya transmission. Sci Rep. 2017;7:3813. doi:10.1038/s41598-017-03566-3

53. Dumic I, Severnini E. Climate change and Lyme disease. Can J Infect Dis Med Microbiol. 2018;2018:5719081. doi:10.1155/2018/5719081

54. Boeckmann M, Joyner TA. Tick distribution under climate change. Health Place. 2014;30:70-77. doi:10.1016/j.healthplace.2014.08.004

55. Couper LI, MacDonald AJ, Mordecai EA. Climate change and Lyme disease incidence. Glob Change Biol. 2021;27:738-754. doi:10.1111/gcb.15435

56. Intergovernmental Panel on Climate Change. Summary for policymakers. Global warming of 1.5°C. IPCC; 2018. https://www.ipcc.ch/sr15/chapter/spm/. Accessed 2025.

57. Tian P, Xiong J, Wu W, et al. Malnutrition and mortality in rheumatoid arthritis. Front Nutr. 2022;9:993061. doi:10.3389/fnut.2022.993061

58. Correa-Rodríguez M, Pocovi-Gerardino G, Callejas-Rubio JL, et al. Nutritional indices in systemic lupus erythematosus. Nutrients. 2019;11:306. doi:10.3390/nu11030638

59. Cereda E, Codullo V, Klersy C, et al. Nutritional risk and mortality in systemic sclerosis. Clin Nutr. 2014;33:558-561. doi:10.1016/j.clnu.2013.08.010

60. Dupont R, Longué M, Galinier A, et al. Micronutrient deficiency in systemic sclerosis. Autoimmun Rev. 2018;17:1081-1089. doi:10.1016/j.autrev.2018.05.010

61. American College of Physicians. Climate change and health care. Ann Intern Med. Published online. https://www.acpjournals.org/doi/10.7326/m15-2766

62. Practice Greenhealth. Climate change and health care sustainability. Practice Greenhealth website. https://files.practicegreenhealth.org/pubs/epp/ClimateChange.pdf. Accessed 2025.

63. Thiel CL, Mehta N, Sejo CS, et al. Telemedicine and environmental emissions. NPJ Digit Med. 2023;6:87. doi:10.1038/s41746-023-00818-7

64. National Center for Biotechnology Information. Rheumatology and environmental health. https://pmc.ncbi.nlm.nih.gov/articles/PMC4276625/. Accessed 2025.

65. Association of American Medical Colleges. Climate change and academic medicine. AAMC; 2023. https://www.aamc.org/media/64106/download. Accessed 2025.

66. Climate Health Education. Climate and health education resources. https://climatehealthed.org/. Accessed 2025.

67. ReACT Rheumatology. About ReACT Rheum. https://reactrheum.org/about-us. Accessed 2025.

Approved by Board of Directors: 2/26