



# Climate change and its impact on human health in South America

*Alterações climáticas e sua repercussão sobre a saúde humana em países da América do Sul*

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## ABSTRACT

Climate change has intensified in the last two decades, damaging the environment and those who inhabit it. Human activity has increased the prevalence and intensity of these changes. Increased social inequality and vulnerability, deforestation, intentional forest fires, soil degradation, and environmental pollution, when associated with sea temperature variability, can lead to extreme weather events, increasing negative health effects. This report summarizes *Lancet Countdown South America* (Hartinger et al. 2023), the result of multidisciplinary collaboration between education institutions and South American health agencies from 12 countries: Argentina, Bolivia, Brazil, Colombia, Chile, Ecuador, Guyana, Paraguay, Peru, Uruguay, Venezuela and Suriname. This should be considered a wake-up call because it contains the results of a climate change survey and its effects on human health in South America. Knowing these effects is the first step toward appropriate, preferably preventive, public health policies.

**Keywords:** Climate change, human health, deforestation, forest fires.

## RESUMO

Nas últimas duas décadas as mudanças climáticas têm se intensificado, causando danos ao meio ambiente e aos indivíduos que nele habitam. Várias ações do ser humano têm contribuído para que cada vez mais essas mudanças climáticas sejam mais presentes e intensas. O aumento das desigualdades e vulnerabilidades sociais, o desmatamento, os incêndios florestais voluntários, a degradação do solo e a poluição ambiental aliados à variabilidade climática global da temperatura da água do mar podem potencialmente levar a eventos climáticos extremos, potencializando os efeitos negativos sobre a saúde. Neste trabalho é apresentado um resumo do relatório do *Lancet Countdown South America*, fruto da colaboração acadêmica multidisciplinar de instituições de ensino e agências sul-americanas de saúde de 12 países (Argentina, Bolívia, Brasil, Colômbia, Chile, Equador, Guiana, Paraguai, Peru, Uruguai, Venezuela e Suriname) publicado por Hartinger e cols. (2023). Este estudo é uma alerta, pois nele são publicados os resultados do levantamento sobre mudanças climáticas e seus efeitos sobre a saúde humana no continente sul-americano. Conhecer-las é o primeiro passo para que políticas de saúde pública sejam instituídas, e, preferencialmente, de modo preventivo.

**Descritores:** Mudanças climáticas, saúde humana, desmatamento, incêndios florestais.

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## Introduction

Climate change has become increasingly present and intense.<sup>1-5</sup> Weather-related events are responsible for damage to the environment as well as to the individuals who inhabit it. Increased social inequalities and vulnerabilities, deforestation, land degradation and global climate variabilities in sea temperature can potentially lead to extreme weather events, enhancing the negative effects on health.<sup>1-5</sup> Understanding the real dimension of the problem, even at the regional level, is the first step to implementing effective adaptation and mitigation measures to avoid and prevent its deleterious effects on human health.

In a recent study, Hartinger et al. published the results of a survey on climate change and its effects on human health in the South America, called Lancet Countdown South America (LCSA).<sup>6</sup> The LCSA was generated by a multidisciplinary academic collaboration that brought together 21 academic institutions and South American agencies of the United Nations from 12 countries (Argentina, Bolivia, Brazil, Colombia, Chile, Ecuador, Guyana, Paraguay, Peru, Uruguay, Venezuela, and Suriname; French Guiana was not considered), led by 28 researchers representing various disciplines. The LCSA aimed to assess the relationship between public health and climate change in South America.

The data and results provided in this report represent the consensus of various experts across multiple fields who have participated in the LCSA and are part of the 2022 global report of the Lancet Countdown.<sup>2</sup> The report brings together several indicators that provide the evidence to support targeted response strategies for decision-makers.

Given the relevance of the topic and the moment we live in, we present below a summary of the 4 main conclusions of the report, in the form of messages.<sup>6</sup>

### **Climate change is harming the health of South Americans, it's time to take prompt action**

The adverse health effects of climate change are accelerating and have disproportionately affected the most vulnerable populations in South America. For the past 10 years, these populations have had their health increasingly affected by climate change-related hazards, and unless actions are taken, this trend will get worse.

In the last 10 years, more frequent and intense heat waves have put children under 1 year of age and adults over 65 at risk. Children aged <1 year were exposed to an estimated 2.35 million more person-days of heat waves each year, and adults aged ≥65 years to 12.3 million more person-days, as compared to a 1996-2005 baseline.

Since the year 2000, an increase in the estimated number of heat-related deaths has been observed among people aged ≥65 years in all countries, being more pronounced in Brazil, Argentina, Colombia, and Venezuela. The cost of these deaths was estimated to correspond to the average income of 485,000 local workers in 2021. Furthermore, the potential regional income loss associated with heat-related reduction in labor productivity in 2021 was US\$22 billion, with the construction and agriculture sectors being the most severely affected, with 68% of the total losses occurring in the region.

Elevated temperatures and increased incidence of droughts, especially in the past decade, have led to an increase in the occurrence of wildfires and exposure of the populations living in these regions. In addition, another aggravating factor that occurs in South America is human-made wildfires, which are more closely related to land use change and deforestation, as seen in the Amazon. Regionally, population exposure to very high or extremely high wildfire danger in South America increased in 9 of 12 countries, with an average increase of 7 more days in 2018-2021 compared to the reference baseline.

Climate change, by changing environmental conditions (more intense and prolonged droughts, extreme weather events, higher temperatures, and increased atmospheric CO<sub>2</sub> concentrations), also interferes with food systems, affecting the growth, yield, and nutritional content of several crops, including 4 staple crops (wheat, rice, maize, and soybean). This is of particular concern given that 168.7 million South Americans are affected by moderate or severe food insecurity. The average duration of the growing season for spring wheat, winter wheat, maize, soybean, and rice decreased by 2.5%, 2.2%, 1.6%, 1.3%, and 0.4%, respectively, compared to the reference baseline (1981-2010). Therefore, these impacts threaten the livelihoods of people who depend on the agricultural sector and pose a serious threat to food security in the region.

The changing environmental conditions have also affected the geographic distribution of infectious

diseases. The region is endemic for dengue, which is responsible for a high disease burden and frequent epidemic cycles across the region. Dengue transmission has reached its highest level in recent years, with an increase of 35.3% in 2012-2021 compared to the 1951-1960 reference baseline, especially in countries where *Aedes aegypti* is found. Other factors, such as urbanization and mobility, also interfere with the spread of dengue. In Brazil and Peru, there has been an increase in its spread to higher latitudes and less populated areas.

Climate change can also trigger viral sharing among previously geographically isolated wildlife species, leading to cross-species transmission and disease emergence. In addition to the increased risk of dengue posed by climate change, temperate Southern Cone countries are highly vulnerable to the severe effects of dengue, mainly driven by rapid urbanization. Argentina and Uruguay experienced increased vulnerability between 1990 and 2019.

### **South American countries must increase their preparedness to protect populations from the health impacts of the climate crisis**

Understanding, assessing, and monitoring the health impacts of climate change and health co-benefits of climate actions is essential for the development of adaptation plans and policies that can protect the health of South American populations against increased flooding, as a result of climate change, and maximize their positive impact.

In view of rapidly increasing health risks resulting from climate change, countries should focus efforts on identifying their specific risks, as well as on developing appropriate adaptation plans. At the subnational level, few municipalities have conducted city-level climate change risk assessments, which raises concerns about whether the data, needs and differences between countries at the local level are being integrated into the National Adaptation Plans (NAPs).

Reflecting the insufficient planning for health adaptation, South American countries have not provided adaptation responses proportionate to the growing risks faced by their populations. Adaptation actions, such as expanding urban green spaces, strengthening health systems, and building more resilient essential infrastructure, have the potential to reduce climate-related health impacts and promote

health and well-being. However, of the 73 urban centers surveyed in 2021, 84% had very low or exceptionally low levels of green space, and only 12 (16%) had moderate levels. These results reflect the limited progress in the implementation of an effective adaptation measure that may not only reduce exposure to health-threatening extremes of heat in urban areas but also provide significant direct benefits through cleaner air, improved mental health and well-being from exposure to green space, and improved overall health outcomes from access to spaces for socialization and recreation.

Improving the health system capacity and resilience is essential because, with the increase in health risks associated with climate change, the population's health needs also increase. Therefore, efforts made by government agencies should focus on ensuring that health facilities have access to the essential services they need to provide adequate care, including water and sanitation services, electricity supply, and Internet connectivity. Health-care infrastructure must also be strengthened to deal with the increasing effects of extreme weather events and to be safe strongholds during climate-related emergencies. The health system capacity must be adjusted to meet the growing demand for care, and resources must be allocated to training and educating health professionals so that they can recognize, prevent, and treat the health consequences of climate-related hazards.

Surveillance, early warning and early response systems must be implemented in collaboration with meteorological agencies and tailored to the local health risks in order to inform the prevention and appropriate response to these health risks. In fact, the call for universal coverage of early warning systems against extreme weather events and climate change was enshrined in the agreement reached in the 2022 United Nations Climate Change Conference or Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC; COP27). However, only Argentina and Brazil report incorporating climate information for heat early warning systems in their health systems. The heat early warning system in Argentina is the only national early warning system that has been implemented and evaluated.

Strengthening South American health systems to better prevent and respond to climate-related health risks will also provide better services, with overall

gains to the health and well-being of the populations. With the fragility of health systems exposed during the COVID-19 pandemic, strengthening local health services should be a priority in local government agendas.

### **South America must continue and accelerate efforts toward the race to zero-carbon transition**

Efforts must be continued and accelerated to mitigate greenhouse gas (GHG) emissions, reduce changes in land use linked to deforestation, decarbonize the energy and transport system, and increase the production and use of renewable energy. Doing so will not only help the region meet its commitments under the Paris Agreement but also provide significant health benefits through improved air quality, reduced energy poverty, reduced inequalities in access to transport, and more active lifestyles.

Although South America is responsible for only 6% of global GHG emissions, it must join efforts to reduce them and, more importantly, to ensure that it is not left behind in the global transformation toward a much healthier, net zero emission system. These emissions are mainly related to land use change (24%), agriculture (28%), and energy production (39%). Therefore, mitigation related to land use and agricultural practices is especially important, requiring a long-term strategy, national and international incentive systems, and strong governance and regulations, which are particularly challenging in South American countries.

Climate change mitigation in the agricultural sector and in land use change linked to deforestation also has the potential to provide significant simultaneous and immediate health benefits to local populations and promote healthier diets, with the additional benefit of reducing premature death from imbalanced diets. In South America, 23% of all deaths attributable to imbalanced diets are related to high intake of red and processed meat and dairy products, whose production is highly carbon intensive (mainly due to emissions associated with livestock feed production and enteric fermentation of ruminants). Therefore, minimizing red meat intake as per dietary guidelines would not only help prevent these deaths but also reduce GHG emissions related to livestock and associated agricultural practices.

Regarding the energy sector, mitigation may also provide substantial and immediate health co-benefits. The burning of fossil fuels not only contributes to increasing GHG concentrations in the atmosphere but also leads to toxic levels of pollution in the air that people breathe. In South America, exposure to particulate matter 2.5 (PM<sub>2.5</sub>) in outdoor air caused 37,000 deaths in 2020 alone, with the highest death rates being observed in Chile (230 deaths/million) and Peru (178 deaths/million). The costs resulting from premature mortality due to air pollution correspond to the average income of 2.9 million productive people.

Switching to clean fuels can also significantly reduce exposure to household air pollution and reduce urban-rural health inequalities. Despite the near-universal access to electricity in South American homes, only half is generated from clean sources such as solar, wind, or hydropower. Furthermore, there are large urban-rural differences, with 23% of the rural population still relying exclusively on biomass fuels for cooking, exposing them to high levels of indoor air pollutants. The annual average exposure to PM<sub>2.5</sub> of a rural household is 171 µg/m<sup>3</sup> (95% CI, 159-183), 34 times higher than the annual threshold of 5 µg/m<sup>3</sup> recommended by the World Health Organization.

Decarbonizing road transport may also provide important benefits to the health of South American populations. Reducing fossil fuel-based road transport may help prevent deaths attributable to exposure to PM<sub>2.5</sub> air pollution generated by the transport sector, with more than 10,100 deaths being recorded in 2020. Expanding access to and use of safe, affordable, and reliable public transport networks would not only reduce the use of fossil fuels but also provide important co-benefits from reducing socioeconomic inequalities associated with transport access. Moreover, promoting modal shift toward active forms of transport through incentives and safe infrastructure can simultaneously provide significant physical and mental health benefits associated with increased physical activity.

Despite these potential health benefits, South American countries increased their per capita energy use for road transport by 138% between 1971 and 2019. Specifically, countries such as Paraguay, Ecuador, Bolivia, and Guyana have tripled their per capita energy use in road transport since the 1970s. This occurred in parallel with the

rapid urbanization process and regional increase in motor vehicle sales.

Fossil fuels remain the main energy source for road transport in South America (84%), followed by biofuels (16%). Although often regarded as a sustainable alternative, biofuels cause net carbon emissions (especially first-generation biofuels), their production typically generates net emissions from land use change, and, most importantly, their combustion emits air pollutants, such as PM<sub>2.5</sub>, that harm human health. Even in Chile and Ecuador, countries that lead the electrification of road transport in the region, less than 1% of the road energy sources comes from electricity. In the region, electricity accounts for only up to 4% of the energy used in road transport.

As the global energy crisis drives sharp increases in international energy prices and the rising inflation threatens people's ability to afford clean energy, energy poverty in the region is likely to increase, and with it so is the use of harmful fuels in people's homes. Rapid action to phase out the use of fossil fuels in the region and increase the local production of clean, renewable energy at all levels (i.e., individual, household, community, and society) would not only help meet the commitments that countries have made in the Paris Agreement but also provide more resilient, stable, and sovereign energy systems for South American populations. This, in turn, would reduce the region's dependence on volatile international fossil fuel markets and geopolitical conflicts, help reduce energy poverty and its associated health impacts, and improve the quality of the air that people breathe across the region.

Concerningly, despite the dangers that the continued overdependence on fossil fuels represent for South American populations, countries in the region continue to offer financial incentives for fossil fuel consumption, hindering the transition to clean, renewable energy sources. Considering all subsidies and carbon pricing instruments, the region continues to effectively subsidize fossil fuel consumption, for a total amount equivalent to an average of 10.5% of government spending on health in the region. Currently, net fossil fuel subsidies in Venezuela, Ecuador, Bolivia, and Argentina account for 85.6%, 29.2%, 23.5%, and 15.4%, respectively, of the national health budget. These net subsidy equivalents range from 3.5% to 4.8% for Brazil, Chile,

and Colombia. In total, the 6 countries spent US\$27.9 billion on fossil fuel subsidies in 2021. Redirecting this spending toward subsidizing renewable energy and protecting vulnerable populations from the rising energy costs and living costs of the energy crisis would not only promote the transition to a healthy, low-carbon future but also contribute to reducing inequalities and energy poverty.

### **South American countries require serious financial commitments to respond to the challenges imposed by climate change**

Implementing climate change adaptation policies and actions for the health and well-being of populations is a no-regrets investment that requires government support, with transparent financial commitments and concrete budget allocation.

Although South American governments have submitted their second round or updated versions of their Nationally Determined Contributions (NDCs), only 8 of the 12 countries submitted revised NDCs by 2021. The percentage change in the number of mentions of health-related terms from the first to the second NDC was 130.4%. The countries with the largest number of mentions were Venezuela, Paraguay, and Colombia. This reflects the awareness of the links between health and climate change and the prioritization of the national climate agendas. However, many of these NDCs are high-level commitments that consolidate a country's intention, in some cases without fully detailing the activities, indicators to monitor its progress, institutional roles and responsibilities, and/or a budget for its implementation. Typically, this more detailed description is developed in NAPs and in sectoral NAPs – in the case of health – a Health NAP. Despite the high-level recognition of the importance of having health-related activities in the countries' NDCs, only Brazil developed a Health NAP by 2021, while other countries (Argentina, Colombia, Chile, and Peru) report having them ready but not submitted or under development.

Despite the urgent need to protect the health of local populations given the rapidly increasing health hazards, health care adaptation is woefully underfunded in South America, with only 10% (US\$36 million) of approved adaptation-related funding dedicated to health in 2021. However, the large sums of money allocated to subsidizing fossil

fuels show that funds are often available but not allocated to activities that would enable a safe and healthy future.

Social and infrastructure spending required to meet climate goals ranges from 7% to 19% of gross domestic product by 2030 (US\$470,000 to US\$1,300,000 million in 2030) depending on initial conditions and proposed economic and social targets. From this perspective, a just transition to a sustainable future requires sufficient funds to be made available to less industrialized countries, including many South American countries. Less industrialized countries need to be empowered to transition to healthy, resilient, zero-carbon energy systems and stronger, better prepared health systems. At COP27, “developed” countries were urged to increase their contribution of climate finance, technology transfer and capacity building to respond to the adaptation and mitigation needs of “developing” countries. Implementing this ambition, which should be advanced at COP28, is essential not only to achieve the goals of the Paris Agreement but also to achieve better and more equitable global health.

The implementation of accelerated climate measures requires support from key actors and sectors of society, such as policymakers, scientists, the media, and the general public. Effective science communication on the links between climate change and health is critical to changing public perceptions, generating demand for action, and informing the implementation of evidence-based adaptation and mitigation policies that maximize health benefits. Media coverage of the relationship between health and climate has increased in South America, reaching an all-time high in major newspapers from 8 countries in 2021. And while the health dimension of climate change remains understudied in the region, original research led by South American researchers has increased by more than 1000% since 2007. Nevertheless, 94% of published articles on health and climate change refer to climate effects on health, while the number of those on the effects of multisectoral action (health co-benefits and adaptation) on climate and health remains low. Research on the benefits of health-focused climate action is urgently needed in South America to inform an evidence-based mitigation and

adaptation response that maximizes the benefits to local populations.

The inaugural LCSA report focuses on (a) the immediate health threats posed by climate change in South America, (b) the limited health adaptation plans developed in the region, (c) our need to accelerate efforts toward the race to zero-carbon transition, and (d) the existing financial gap to address the health burden of climate change in South America. Furthermore, the report highlights the need to promote regional efforts in order to build resilient health systems and reduce the converging effect of inequality, poverty, and vulnerability in the face of climate change. Never has it been more important to work toward the Paris Agreement to limit the global average temperature increase to 1.5 °C and to free up the financial resources needed for an effective climate response. In addition, such climate action may provide immediate and substantial benefits, saving millions of lives each year, by improving air quality as well as diet and physical activity, and making health systems more resilient.

The LCSA calls on governments and various stakeholders in the region to initiate and accelerate a coordinated response and to define and undertake clear actions that address the challenges posed by climate change, thus ensuring healthy lives, clean environments, ecosystem services, and well-being for all South American peoples.

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