

Alliance of Academic Health Centers (AAHCI) Student Leadership Initiative (ASLI)

The Convergence of Climate Change and Health Professions Education

BACKGROUND

The AAHCI Student Leadership Initiative ([ASLI](#)) was created to challenge health profession students at academic health centers to submit proposals sharing new ideas or innovative programs tackling key topics in health professions education.

AAHCI, in partnership with the [AAHCI Latin America and the Caribbean \(LAC\) Regional Office host](#), the University of São Paulo Medical School ([FMUSP](#)), supported this initiative in the LAC region. The LAC region launched the initiative in 2021, inviting medical students from member institutions in the region to submit proposals sharing innovative ideas on virtual medical education.

ASLI 2022 focused on student innovative approaches to the convergence of climate change, healthcare, and health professions education.

Specifically, students were invited to share proposals that highlight new ideas or existing innovative programs or studies that achieve one of the following:

- 1) Inspires research and innovation in healthcare in response to the impact of climate change on the environment (e.g., tropical diseases)
- 2) Addresses the health effects of climate change as it relates to patient care
- 3) Encourages academic health centers to reduce their environmental impact

This *Compendium* is a compilation of all abstracts submitted from students at participating institutions:

- Faculdade das Américas (Brazil)
- Pontificia Universidad Javeriana (Colombia)
- TecSalud, Tecnológico de Monterrey (Mexico)
- Universidad del Rosario (Colombia)
- University of Malaya (Malaysia)
- University of São Paulo Medical School (Brazil)
- Vanderbilt University School of Medicine (USA)

The first three abstracts in the *Compendium* are those selected as finalists by the reviewing committee. The authors provided presentations on their ideas in an ignite-style session held at the [2022 LAC Regional Meeting](#) in São Paulo, Brazil.

The presentations can be viewed [here](#).

Convergence of Climate Change and Health Professions Education Latin America & the Caribbean (LAC) Region *Submission Abstracts*

FINALISTS

Building Latin America's Future Health Workforce: Climate and Health Integration in a Medical Competency-based Curriculum, Juan Campos, Medical Student; Daniela Cortés, Public Health Student; Gilma Mantilla, Supervision; and Alejandro García-Cajiao, Supervision, Pontificia Universidad Javeriana (PUJ) (Colombia)

Database and Climate Change, Felipe Fonseca, Medical Student; Telma de Cássia dos Santos Nery, Advisor, Faculdade das Américas (FAM) (Brazil)

Policymaking Experience to Address Health Effects of Climate Change, Hillary G. Ayala-Garcia, Medical Student; Frida Victoria Leos Alvidrez, Medical Student, TecSalud, Tecnológico de Monterrey (TecSalud) (Mexico)

SUBMISSIONS

Alzheimer's Disease, Race, and Environmental Justice, Kelsey Barter, Medical Student; Eli Zimmerman, Advisor, Vanderbilt University (VU) (USA)

Approaching Telemedicine to Reduce Environmental Impact and Carbon Footprint, Tan Shu Fan, Medical Student; Tan Thean Win, Medical Student; Helena Chin Shu Hua, Medical Student; Ooi Yu Kuan, Medical Student; Dr. Nasrin Agha Mohammadi, Advisor, University of Malaya (UM) (Malaysia)

Changes in the Social Treatment of Patients Due to Climate Change, Ximena Ortiz de la Peña Herrera, Medical Student, TecSalud, Tecnológico de Monterrey (TecSalud) (Mexico)

Climate Change and Cardiovascular Diseases: Introduction to the TecSalud Curriculum, Shelsya Merany López Duarte, Medical Student; Dr. Carlos Alberto Zertuche Zuani, Advisor, TecSalud, Tecnológico de Monterrey (TecSalud) (Mexico)

Climate Change's Effects on Physical Well-Being and Mental Health, Juan Camilo Roa Maldonado, Universidad del Rosario (UdR) (Colombia)

Fighting Skin Cancer from an Ecological Point of View, Luis Enrique Castro Alvarado, Medical Student; Carlos Enrique Pérez Suárez, Medical Student, TecSalud, Tecnológico de Monterrey (TecSalud) (Mexico)

Sustainability Challenges Among the Mexican Public Hospitals, Karina Aguilar García, TecSalud, Tecnológico de Monterrey (TecSalud) (Mexico)

The Role of Climate Change and Air Pollution in Neurodegenerative Diseases in the Context of Industrial Cities, Vanessa Alegria-Saldivar, Medical Student; Alexa Boehm, Medical Student, TecSalud, Tecnológico de Monterrey (TecSalud) (Mexico)

Weather Monitoring as a Tool to Improve Quality of Life, Andrea Jimena Morales Arteaga, Medical Student; Ginelaa Sharón Pérez Fernández, Medical Student, TecSalud, Tecnológico de Monterrey (TecSalud) (Mexico)

ABSTRACTS

2022 AAHCI Student Leadership Initiative (ASLI)

Building Latin America's Future Health Workforce: Climate and Health Integration in a Medical Competency-based Curriculum

Pontificia Universidad Javeriana (PUJ) (Colombia)

AUTHORS

Juan Campos, *Medical Student*; Daniela Cortés, *Public Health Student*;
Gilma Mantilla, *Supervision*; and Alejandro García-Cajiao, *Supervision*



SUMMARY

Medical professionals are among the most trusted voices in the health community; it is, therefore, imperative that they are knowledgeable about climate change and environmental issues. Surveys conducted at the global, regional, and national levels have demonstrated significant gaps in knowledge; and there are few developed educational programs or curricula. Institutional knowledge on health protection measures is limited for various reasons, including a lack of structured climate change and environmental health content in medical undergraduate degrees, as well as a lack of funds for research, especially for developing countries (Leal Filho et al., 2021; Palmeiro-Silva et al., 2021; Mantilla et al., 2019).

The interest in incorporating climate change into medical education has increased significantly in recent years, and change is often driven by students (Howard, 2019; Marill, 2020; Rabin et al., 2020). In 2017, the Global Consortium on Climate and Health Education (GCCHE) emerged from an identified need during COP-21 to invest more in research and mitigation strategies for the health effects of climate change. Based at Columbia University, the GCCHE is committed to educating health professionals around the world to prevent, reduce, and respond to the health impacts of climate change. Despite important efforts, such as those made by the Consortium and several institutions around the world, recognition of climate and health education as a global priority has a long way to go.

Building on the GCCHE's competencies, this project addresses current knowledge gaps in education and resources related to climate change and health. The goal is to integrate these topics into a competency-based curriculum in a Colombian undergraduate medical program.

This project will consist of four complementary and interrelated phases: (i) socialization and dissemination of the project purpose within the educational staff; (ii) curriculum design and development; (iii) incorporation of pilot courses; and (iv) monitoring, evaluation, and adjustments. During implementation, various qualitative and quantitative evaluation methods will be utilized to obtain periodic results and define adjustments to improve the project. Once successfully integrated, this work can be used to develop a best-practices framework for curricular integration of climate and health for medical schools across Latin America and globally according to the needs of specific institutions. Spearheading this project are a medical student from Pontificia Universidad Javeriana in Bogota, Colombia, a public health graduate student from Columbia University in New York, United States, and medical professors and representatives for the GCCHE at Pontificia Universidad Javeriana.

Education of the health workforce on a global, regional, and national scale plays a critical role in addressing the climate crisis. It is necessary to increase knowledge and skills among medical students to build capacity, so they continue to serve as trusted voices within their professions and institutions (Henderson, 2021). Through interdisciplinary cooperation, the first cohort of Colombian medical professionals will be trained with a foundational knowledge of the interactions between climate change and health, a scientific understanding of those interactions, and potential adaptation and resilience-building solutions.

2022 AAHCI Student Leadership Initiative (ASLI)

Database and Climate Change

Faculdade das Américas (FAM) (Brazil)

AUTHORS

Felipe Fonseca Martins Costa, *Medical Student;*

Telma de Cássia dos Santos Nery, *Advisor - INCOR HC FMUSP*



PURPOSE

The technology movement brings new information about population behavior that impacts public health. Web searches in Brazil are a common tool for acquiring information about disease development related to question specificity. Besides this, in Brazil, the health database has no fill notification about disease occurrence. This is a problem for understanding the impact of disease in a population under current disease conditions. Additionally, climate change has a human impact on public health that needs to be understood. So, the data relationship between different niches is a problem proposed to be addressed in this work.

INNOVATION

This problem was approached mathematically under different databases. Using meteorological data from INPE for the last 10 years of temperature history and Google Trends index history reports, climate change could be related to specific public health problems that the population was searching while surfing the internet. The specific theme chosen for this mechanism was elderly people's falls related to temperature variations.

The hypothesis development used for this mathematical analysis was about stress in pathophysiology development. Temperature variation is a stress trigger according to scientific literature, causing metabolic responses that, in elderly people, will integrate several conditions to induce increased falling. These metabolic responses include blood pressure oscillation in hemodynamics that produce balance disorders. Additionally, when an elderly person falls, it is a problem in social dynamics that induces internet searches to manage critical conditions. So, this innovation is to expose an application for a critical health problem in Brazil.

IMPACT

This innovation impacts, in the short term, our understanding of other public health conditions as a parameter for health professional knowledge and new perception building. Knowing about this tool makes it possible to increase differential diagnosis investigation, including climate changes, in disease development. So, this solution can expose clinical thinking to new information for a new current reality.

This solution, in the long term, is an invitation for new associations between different databases to disease anticipations on a large scale. This information is useful for health education for a reality with intense volatile occurrence behavior. In this way, it is possible to understand a scenario of changes with more acuity by mathematical proof applied to public health actions.

2022 AAHCI Student Leadership Initiative (ASLI)

Policymaking Experience to Address the Health Effects of Climate Change

TecSalud, Tecnológico de Monterrey (TecSalud) (Mexico)

AUTHORS

Hillary G. Ayala-Garza, *Medical Student*; Frida Victoria Leos Alvidrez, *Medical Student*



SUMMARY

Health is the result of multiple determinants. This proposal approaches public health, policymaking, and climate change. With exposure to local public policymaking, health sciences students can understand the political system as well as encourage experience in public health pathways. The objective is a development of policies for the climate crisis with current students. Due to the lack of curriculum on the impact of climate change in health and advocacy in our political system as health professionals, the introduction of a health policymaking experience to address health effects of climate change is an innovative and very needed answer.

PURPOSE

Health is the result of multiple determinants; one determinant that has the greatest impact and responsibility in its impact on health is politics. Public representatives are responsible for defending, increasing, avoiding negative impacts on, and ensuring accessible health services according to the needs of the population. This translates into actions and public initiatives for protection, promotion, prevention, and health care. In Mexico, any citizen may present initiatives to strengthen, change, or create new laws. Therefore, if any flaw or need for legislation is identified, such as those related to climate change or health systems, laws may be created after thorough research and participation.

It is not news that climate change is currently a global emergency that threatens health and puts lives at risk. The dangers related to the environment are directly related to an increase in diseases, especially those transmitted by a vector. There is greater awareness of the repercussions of climate change, which has been linked to a growing recognition of the impact it has on the health of patients and health institutions. Therefore, various educational institutions are implementing courses that encompass health, medical care, and climate change that generate thoughts and actions together.

According to the Nuevo León Council for Strategic Planning (2021), the state of Nuevo León is in a severe environmental crisis: extreme drought and water deficits, loss of biodiversity, poor waste management, and high concentrations of PM 10 and PM 2.5 particles in the air that constantly activate environmental alerts. Yet, the current solutions are limited to water cuts to citizens, including hospitals, around the state as well as poor waste management strategies. As of today, there are not enough efforts to protect and foresee the impact on the health of the citizens. Our current political system needs passionate and experienced health professionals in public policy.

INNOVATION

Tecnológico de Monterrey has obtained international renown for its innovative model of education: TEC21. One of the model's characteristics is that at the end of every period (five weeks) there is a week dedicated to a hands-on experience in a formative topic. Depending on the proposal, the experience is open to as many majors and students who wish to participate. Due to the lack of curriculum on the impact of climate change in health and advocacy in our political system as health professionals, the introduction of a health policymaking experience to address health effects of climate change is an innovative and very needed program. The program is divided into three components: 1) public health, global health, epidemiology, and health systems; 2) climate change and health; 3) public policy and advocacy.

IMPACT

This proposal can expose health sciences students to understand our political system as well as encourage a public health pathway. The COVID-19 pandemic showed the absence in preparedness of health systems, especially in developing countries. Through creation of policies for the climate crisis with current students, our proposal would strengthen the health systems as well as train the next generation of key actors.

2022 AAHCI Student Leadership Initiative (ASLI)

Alzheimer's Disease, Race, and Environmental Justice

Vanderbilt University (VU) (USA)

AUTHORS

Kelsey Barter, *Medical Student*; Eli Zimmerman, *Advisor*

PURPOSE

The global climate crisis is the greatest threat to human health in this century. The scope of medical education in recent years has grown beyond the basic sciences; however, the health effects of climate change are infrequently covered in the pre-clinical curriculum or in core clerkships. While most medical students are aware that, for example, asthma is associated with increased exposure to air pollution, there is little recognition of how environmental hazards affect other organ systems, including the nervous system.

INNOVATION

We created a didactic session for neurology clerkship students to illustrate how increased exposure to air pollution might predispose individuals to the development of Alzheimer's disease (AD). Prior to the session, students watched a short video presentation by an expert on racial disparities in AD and read one of two articles about exposure to air pollution and risk of dementia and AD [Shi 2021, Younan 2021]. All students participated in a discussion about the video and articles, facilitated by a senior student and the clerkship director. Several key points arose within the discussion including:

- The increased rate of AD in minority populations in the U.S. cannot be explained by biological differences between racial groups and is more likely the result of differing lived experiences of racial minorities, including increased exposure to air pollution.
- Multiple population-level studies of Medicare patients have demonstrated that increased exposure to particulate matter 2.5 is associated with increased risk of developing dementia and AD, after adjusting for other demographic factors, including socioeconomic status.
- In both studies, for individuals who identified as black there was an increased positive correlation between air pollution and rate of dementia and AD (i.e., black race is an effect modifier).

IMPACT

This session occurs monthly with new groups of medical students. It is intended to prompt students to think critically about how environmental factors and race may be contributing to a patient's clinical presentation. By providing this example of an occult effect of climate change on a very common neurologic disease, we hope to inspire students to think about how climate change might be contributing to other diseases they encounter in their clinical rotations and eventual practice. The long-term goal of this innovation is to inform a new generation of climate-conscious physicians who can appropriately counsel their patients on how to protect themselves and their families from the harmful health effects of climate change.

2022 AAHCI Student Leadership Initiative (ASLI)

Approaching Telemedicine to Reduce Environmental Impact and Carbon Footprint

University of Malaya (UM) (Malaysia)

AUTHORS

Tan Shu Fan, *Medical Student*; Tan Thean Win, *Medical Student*; Helena Chin Shu Hua, *Medical Student*; Ooi Yu Kuan, *Medical Student*; Dr. Nasrin Agha Mohammadi, *Advisor*

SUMMARY

The healthcare Industry is one of the most important services for mankind, yet it has a negative impact on the environment. Travel to and from the hospitals and healthcare providers, waste generation, the consumption of power, etc. all contribute to greenhouse gases. Climate change as a result of greenhouse gas emissions includes global warming, increasing sea levels, and flash floods. Where flooding occurs, there is a potential for contaminating the water supply and interfering with sanitation and hygiene of our daily lives. Vector-borne, food-borne, and water-borne infections will result. Furthermore, air pollution may have an adverse effect on a patient's health, resulting in a decline in cognitive function and development. Also, respiratory disorders such as asthma, bronchitis, and others may become more prevalent in the population. In a nutshell, climate change has an impact on patient health and patient care.

To counter the environmental impact of the healthcare industry, we propose the use of telemedicine with existing telehealth services provided by UMMC by adding teleconsultation and tele-prescription into TALIAN MAKLUKAT UJIAN (TaMU). During the COVID-19 outbreak, University Malaya Medical Center (UMMC), an academic health center, started TaMU. TaMU is a telehealth service that provides blood/urine/sputum results via phone call to reduce physical contact in order to prevent the spread of viruses. The downside of TaMU is patients still have to come to the hospital for follow-up visits and prescription of medications. Our aim of implementing telemedicine into TaMU is to increase consultations via telecommunication to diagnosis and initiate treatment for non-emergencies cases. Clinicians are able to monitor patients' conditions and past medical history remotely, hence deciding if there is a need for further medical intervention.

The main strategy to propose/encourage UMMC to use telemedicine is to:

- 1) Conduct a systematic review using the PRISMA guideline. The aim of doing a systematic review is to critically review and formally synthesize the best existing evidence as to the impact that telemedicine has on the environment. Through this evidence-based approach, we can potentiate UMMC to integrate telemedicine into the system.
- 2) Start a pilot study to assess the potential challenges and feasibility of telemedicine before implementing it fully in UMMC.

The short-term impacts of telemedicine could reduce outpatient visits, transportation usage, and patient volume. Patients can attend follow-up and have teleconsultation after receiving results from TaMU without the need of traveling to UMMC. In the long term, this reduces the travel-related carbon emission, which would add to reducing the environmental impact of the healthcare industry. All in all, we believe that telemedicine should be widely used in all hospitals to achieve a net zero carbon emission in the healthcare sector.

2022 AAHCI Student Leadership Initiative (ASLI)

Changes in the Social Treatment of Patients Due to Climate Change

TecSalud, Tecnológico de Monterrey (TecSalud) (Mexico)

AUTHOR

Ximena Ortiz de la Peña Herrera, *Medical Student*

SUMMARY

Objective: Address the health effects of climate change as it relates to patient care.

Health and well-being and climate action are two of the most important goals established by the United Nations for sustainable development since 2015. These global objectives were designated to take advantage of our strengths, capacity, and knowledge. Sadly, things have not gone as planned; not because we do not know about our current situation, but because we have chosen to not respond. Let's face it, over time, there have been multiple opportunities for us to stop and see what has been going on in the world – specifically, in terms of climate change. When it comes to associating the consequences of climate change and health care, we can easily see the impact due to our actions and inaction. Certainly, for most of us, it may be uncommon to look for a single explanation of how this global emergency is reflected in terms of health, especially in the way patients are treated by medical communities.

First of all, we must be clear about how our planetary health impacts the well-being of the population: rising temperatures and atmospheric contamination caused by human activity have led to respiratory, renal, and cardiovascular complications; they can also cause reproductive, oncological, neurological, and cognitive capacity problems. Equally important, decreasing rainfall and a rising sea level directly impact the availability of clean water, which is related to hygiene problems and the spread of diseases. Similarly, the increased drought has affected farming and cattle ranching, which can result in food shortages and malnutrition.

These are just some of the consequences we have brought into our lives; they may not be affecting many of us right now, but it does not mean that we may not suffer from one or more of them in an uncertain future. The world needs an immediate response to this crisis, and doctors have a huge responsibility given the global implications. Health professionals are engaged in the need to respond to climate change threats and the impact on the health sector and on population health. The best thing that can be done to improve the treatment and care of patients is to prepare for and adapt ourselves to potential impacts. Even though we do not want to recognize it, it is already too late to prevent some of the impact. We must commit to promoting actions that situate the climate emergency as a public health priority. It is time to redefine the concept of health, revalue the relationship between human health and natural resources, and also to enforce the responsibility of educating the population in beneficial habits.

The time to act is now.

2022 AAHCI Student Leadership Initiative (ASLI)

Climate Change and Cardiovascular Diseases: Introduction to the TecSalud Curriculum

TecSalud, Tecnológico de Monterrey (TecSalud) (Mexico)

AUTHORS

Shelsya Merany López Duarte, *Medical Student*; Dr. Carlos Alberto Zertuche Zuani, *Advisor*

SUMMARY

Climate change affects all socioeconomic classes, but people who are in a vulnerable economic situation are the most affected. People who cannot afford air conditioning or whose work involves long hours in the sun are the people who will be exposed most often to harmful increases in body temperature. Mean ambient temperature increases are considered chronic (Butler, 2018) (Kjellstrom, 2016). As a result of climate change, there will be an increase in the incidence of diseases in vulnerable sectors. All the aforementioned problems also will increase the economic gap due to the costs of diseases, in addition to lost work capacity and labor productivity (WHO, 2018).

Climate change increases the incidence and risk for rhythm disorders, coronary artery disease, and chronic heart failure (Tian, 2012) (Lim, 2012). The positive relationship between cardiovascular mortality and higher temperatures is most widely described in retrospective studies of abnormal heatwaves (Fouillet, 2006) (Knowlton, 2009) (Michelozzi, 2009). Furthermore, humidity is steadily increasing, making heat dissipation less efficient for humans (Russo, 2017) (Schär, 2015) (Rossati, 2016).

At TecSalud, Tecnológico de Monterrey (Mexico), there is not a deep approach to the cardiovascular effects of climate change in its curriculum. A molecular and clinical focus on climate change is important to know the consequences, changes, and updates that will have to be taken into account in patients. The elements to be implemented in the proposed curriculum will be discussed as part of the adaptations that must be considered.

A person can lose as much as 1-2 liters of water per hour from sweat production under extreme heat exposure; therefore, the major limiting factor to maintaining an adequate core temperature is the availability of water. This water loss in sweat decreases plasma circulating volume and leads to dehydration, which stresses the cardiovascular system (Tang, 2016). This hypovolemia and redistribution of blood to cutaneous blood vessels reduces perfusion to the kidney, which triggers the activation of the renin-angiotensin system.

Another thermodynamic mechanism that helps to dissipate heat from the body is evaporation. Evaporation is the transfer of heat when sweat evaporates from the skin surface; this mechanism depends on ambient humidity (Tansey, 2015).

On the other hand, dehydration plays an important role in the hemodynamics of heat response. The result of sweat release is dehydration and hyperosmolality in the blood. There are studies that connect hyperosmolality caused by dehydration of heat stress as an inductor of hypertension and chronic kidney disease (CKD) (Johnson, 2014).

From 2005 to 2006, (Solis, 2007) studied the effects of heat exposure on agricultural workers from Nicaragua, showing hyponatremic or hypertonic dehydration in workers with low water intake. The results were that dehydration from heat stress has hazardous effects on renal function. Another study in agricultural workers with conditions of extreme heat stress is from 2012 in El Salvador, made by Peraza et al. In this study, they found a potential relation between repeated volume depletion and decreased kidney function.

As we can see, the physiology and pathophysiology change dramatically in the human body when the effects of climate change are added. Climate change is heterogeneous in the world, and Mexico is one of the most vulnerable countries to temperature increase due to its geography (Murray-Tortarolo, 2021). In northern Mexico, there also is the delicate issue of water scarcity (Ortega, 2018). Chronic dehydration will be something that should be studied to understand the clinical pictures that medical students continually will see. It is important to implement as part of the curriculum a complete subject focusing on the cardiovascular effects of prolonged exposure to temperature and extreme dehydration as a result of climate change. The final purpose of curriculum change is to be able to train doctors to face the emerging climate crisis.

Bibliography

- Butler, C. (2018). Climate Change, Health and Existential Risks to Civilization: A Comprehensive Review (1989–2013). *International Journal of Environmental Research and Public Health*, 15(10), 2266. doi: 10.3390/ijerph15102266
- Fouillet, A., Rey, G., Wagner, V., Laaidi, K., Empereur-Bissonnet, P., & Le Tertre, A. et al. (2008). Has the impact of heat waves on mortality changed in France since the European heat wave of summer 2003? A study of the 2006 heat wave. *International Journal of Epidemiology*, 37(2), 309-317. doi: 10.1093/ije/dym253
- Johnson, R., Rodriguez-Iturbe, B., Roncal-Jimenez, C., Lanaspa, M., Ishimoto, T., & Nakagawa, T. et al. (2014). Hyperosmolarity drives hypertension and CKD—water and salt revisited. *Nature Reviews Nephrology*, 10(7), 415-420. doi: 10.1038/nrneph.2014.76
- Kjellstrom, T., Briggs, D., Freyberg, C., Lemke, B., Otto, M., & Hyatt, O. (2016). Heat, Human Performance, and Occupational Health: A Key Issue for the Assessment of Global Climate Change Impacts. *Annual Review of Public Health*, 37(1), 97-112. doi: 10.1146/annurev-publhealth-032315-021740
- Knowlton, K., Rotkin-Ellman, M., King, G., Margolis, H., Smith, D., & Solomon, G. et al. (2009). The 2006 California Heat Wave: Impacts on Hospitalizations and Emergency Department Visits. *Environmental Health Perspectives*, 117(1), 61-67. doi: 10.1289/ehp.11594
- Lim, Y., Hong, Y., & Kim, H. (2012). Effects of diurnal temperature range on cardiovascular and respiratory hospital admissions in Korea. *Science Of the Total Environment*, 417-418, 55-60. doi: 10.1016/j.scitotenv.2011.12.048
- Michelozzi, P., Accetta, G., De Sario, M., D'Ippoliti, D., Marino, C., & Baccini, M. et al. (2009). High Temperature and Hospitalizations for Cardiovascular and Respiratory Causes in 12 European Cities.

American Journal of Respiratory and Critical Care Medicine, 179(5), 383-389. doi:
10.1164/rccm.200802-217oc

Murray-Tortarolo, G. (2021). Seven decades of climate change across Mexico. *Atmósfera*. Doi:
10.20937/atm.52803

Ortega-Gaucin, D., de la Cruz Bartolón, J., & Castellano Bahena, H. (2018). Drought Vulnerability Indices
in Mexico. *Water*, 10(11), 1671. Doi: 10.3390/w10111671

Peraza, S., Wesseling, C., Aragon, A., Leiva, R., García-Trabanino, R., & Torres, C. et al. (2012).
Decreased Kidney Function Among Agricultural Workers in El Salvador. *American Journal of Kidney
Diseases*, 59(4), 531-540. Doi: 10.1053/j.ajkd.2011.11.039

Rossati, A. (2017). Global Warming and Its Health Impact. *The International Journal of Occupational and
Environmental Medicine*, 8(1), 7-20. Doi: 10.15171/ijoem.2017.963

2022 AAHCI Student Leadership Initiative (ASLI)

Climate Change's Effects on Physical Well-Being and Mental Health

Universidad del Rosario (UdR) (Colombia)

AUTHORS

Juan Camilo Roa Maldonado, *Medical Student*; Dr. John Vergel, *Mentor and Advisor*

SUMMARY

The global impact of climate change has had unimaginable changes on human life that continue to change the planet. New challenges for maintaining a healthy lifestyle have emerged. This current and ongoing issue is one that requires immediate action; measures must be taken to reduce levels of atmospheric carbon dioxide, which is produced by use of fossil fuels, burning trash, and factory emissions, to name a few. In terms of health, increasing temperatures, more radiation, extreme weather, exacerbation of mental health for people, and more harsh living conditions will ultimately dismantle already unstable health care systems. The burden brought along by climate change comes in many forms. Floods, droughts, and fires destroy and displace communities and food sources and increase financial burden. Not only that, but extreme events lead to changes in vector populations and are accompanied by water and food related illness. We are not only seeing changes in our physical lives, but also in regard to mental health. Some of the obvious examples of deterioration in our lives are changes in sleep patterns, mental health, time management, socialization with others, and frequency of physical activity.

Contrary to what would be expected during a pandemic, no slowing of climate change was achieved. Many people became more reliant on a consumer-based market, essentially not cutting down on emissions or waste as everything needed could be brought to the door. There was no need to leave one's home or interact with any other person. Mass hysteria as well as the unforeseen pressure that the pandemic enacted, rates of clinical depression and anxiety, and general levels of stress took on a massive uptake. The lack of social interactions directly correlates to adverse 15ancerve effects—not only on emotional health but also on physical health (sleep, nutrition, and exercise). Due to this, people's pleasure systems become impacted, resulting in depression. We know that loneliness has been recognized as a public health issue as it leads to poor health outcomes and increases the risk for premature death.

The first step is to acknowledge this issue. We need to be making changes at an individual level, seeing improvements that would, in turn, lead to large-scale changes on a community, state, and national level. We can do things in the space in which we live: improve air quality, reduce waste, better manage nutrition, and ultimately better our emotional and psychological health. In the long run, we would expect to see a slowing of global temperatures as well as a lessening of the burden on the healthcare system if we as healthcare professionals can bring attention to the problem, start the change, and hopefully be models for clinics and hospitals who would, in effect, become examples for all institutions at the state-national level. Without promotion from individuals and the scientific community, the seriousness of this issue will never reach the general population, which is why it is of utmost importance to enact change now.

2022 AAHCI Student Leadership Initiative (ASLI)

Fighting Skin Cancer from an Ecological Point of View

TecSalud, Tecnológico de Monterrey (TecSalud) (Mexico)

AUTHORS

Luis Enrique Castro Alvarado, *Medical Student*; Carlos Enrique Pérez Suárez, *Medical Student*

SUMMARY

Skin cancer is a global problem. According to the World Health Organization (WHO), every year there are between two and three million cases of skin cancer, of which 132,000 are melanomas, the most dangerous form of skin cancer that causes the majority of skin cancer deaths (Prevención y tratamiento del 16cancer de piel, 2019). One of the main risk factors of this cancer is UV rays, especially UVB. These rays are penetrating in higher proportions due to the weakening ozone layer, which is largely caused by the production of different greenhouse gases, such as methane or CO₂. As these gases aggravate global warming and weaken the ozone layer, a process that results in increased UVB rays (which are also related with skin cancer), it is important to find a solution to help to solve both problems.

PURPOSE

In order to fight global warming and reduce the incidence of skin cancer, something must be done to reduce greenhouse gas emissions. Replacing the use of expanded polystyrene in construction is one such action. Expanded polystyrene is used in construction as thermal insulation to maintain warm temperatures in rooms. However, this product produces 86 times more CO₂ and methane than other similar products (Aldana, 2019). These materials weaken the ozone layer, thus making it easier for UVB rays to pass through the atmosphere. We propose changing this material for other more ecological alternatives.

INNOVATION

Alternatives currently exist to expanded polystyrene, such as Hapxöl, a thermal insulation made of corn waste that is less flammable than its synthetic counterpart (Aldana, 2019). Why corn? Since it is the most produced cereal worldwide, there is a large quantity of corn waste that can be reused (Worldwide production of grain in 2021/2022, by type, 2022). By using natural products derived from plants such as Hapxöl, not only are waste products from corn harvest repurposed, but there is also an eco-friendlier replacement for a material that weakens the ozone layer.

IMPACT

The impact of this innovation depends on the country in which it is implemented. For example, in Mexico 75% of the production of expanded polystyrene is destined for use in construction and packaging, while the other 25% is destined for disposable products, with a total production of 350 million tons per year. Furthermore, expanded polystyrene takes between 500-800 years to degrade, and it can represent up to 15% of the volume of landfills (Gaceta del senado, 2016). The use of alternative insulation materials can reduce the production of expanded polystyrene, thereby decreasing damage to the ozone layer, reducing the incidence of skin cancer cases around the world, and producing a positive impact to reduce global warming.

References

- Prevención y tratamiento del cáncer de piel. (July 4th 2019). In Caeme. Retrieved from:
<https://www.caeme.org.ar/prevencion-y-tratamiento-del-cancer-de-piel/#:~:text=La%20Organizaci%C3%B3n%20Mundial%20de%20la,132.000%20casos%20en%20el%20mundo>
- Aldana,M. (December 18th 2019). Sinaloenses ofrecen alternativa ecofriendly para la construcción. In ConectaTec. Retrieved from: <https://tec.mx/es/noticias/sinaloa/empreendedores/sinaloenses-ofrecen-alternativa-ecofriendly-para-la-construccion>
- Gaceta del senado. (2016). In senado. gob. Retrieved from:
https://www.senado.gob.mx/64/gaceta_del_senado/documento/60624
- Worldwide production of grain in 2021/2022, by type. (January 31 2022). In Statista. Retrieved from:
<https://www.statista.com/statistics/263977/world-grain-production-by-type/>

2022 AAHCI Student Leadership Initiative (ASLI)

Sustainability Challenges in Mexican Public Hospitals

TecSalud, Tecnológico de Monterrey (TecSalud) (Mexico)

AUTHOR

Karina Aguilar García, *Medical Student*

PURPOSE

Many of us think of health centers as these white and clean places where all our health needs will be met. Few consider the environmental impact that these places generate, with the incessant use of electricity, water waste, and generation of garbage per day in each hospital (1.5 kg per patient). It is well known that these actions intensify the deleterious effects of climate change.

In Mexico, public hospitals represent $\frac{1}{3}$ of the total number of hospitals and are used by more than 90% of the population. This means that our goal must be focused on this subdivision with limited resources, to generate a greater impact. The challenge in this context is to generate small, affordable, realistic changes that have an impact on the relationship between healthcare delivery and sustainability.

INNOVATION

The ideas to be considered arise from the implementations of the ABC Medical Center (CMABC) and other Mexican private hospitals with the challenge of adapting them to the public healthcare sector. These include:

Short-term ideas:

- Labeled garbage containers that ease the recycling process and allow the sale of materials such as cardboard and glass
- Implementation of green walls--generators of atmospheric carbon, attractors of insects and pollinators, facilitators of recreation (stress reduction)
- Urban gardens without the use of fertilizers--allowing the internal use of harvested products, as well as education for employees and patients on how to create their own gardens and maintain them (sustainable culture)
- Use of LED light and water saving devices
- Training on saving electricity and water among employees (sustainable culture)

Long-term ideas:

- Creation of an institute that regulates the generation of waste and greenhouse gases from hospitals, generates research on sustainable initiatives, and creates competition between hospitals, rewarding them through renewable energy sources
- Implementation of solar heaters and solar panels--generating fewer greenhouse gases

IMPACT

The expected short-term impact is greater water savings, a decrease in the combustion of fossil fuels to generate electricity (it will be a saving at the expense of a large initial investment, but profitable in the long term), a decrease in the generation of waste and improvement in recycling.

Green areas and urban gardens are expected to improve air quality. Likewise, these alternatives, including white roofs, can reduce the effect of heat absorbed by the hospital, thus reducing the use of air conditioning by 15% per year.

The long-term impact will focus on the most important objective: creating a sustainable culture that perceives climate change as an urgency and acts to reduce human intervention on nature. With a sustainable culture, there will be thousands of projects from around the world, implementing the ideas that best suit their region.

I intend to test these solutions in Mexican public hospitals to measure changes, adjusting and finding new solutions relevant to each geographic area. The opportunity is opened for improvement comments and new ideas to generate a favorable environmental impact. The key is to never stop trying and to build step-by-step a better and a more sustainable future.

References

- Patz, J. A., Frumkin, H., Holloway, T., Vimont, D. J., & Haines, A. (2014). Climate change: challenges and opportunities for global health. *JAMA*, 312(15), 1565–1580.
<https://doi.org/10.1001/jama.2014.13186>
- Centro Médico ABC. (2021). Medio Ambiente, ¿cómo lo cuidamos en el Centro Médico ABC?. Retrieved from: <https://centromedicoabc.com/revista-digital/medio-ambiente-como-lo-cuidamos-en-el-centro-medico-abc/>
- México ante el cambio climático. (2021). SISTEMA DE INFORMACIÓN SOBRE EL CAMBIO CLIMÁTICO. Retrieved from: <https://cambioclimatico.gob.mx/>
- ONU. (2022). Cambio climático, test de antígenos y ómicron, México... Las noticias del miércoles. Retrieved from: <https://news.un.org/es/story/2022/01/1502792>
- Ciesielski T. (2017). Climate Change and Public Health. *New solutions : a journal of environmental and occupational health policy* : NS, 27(1), 8–11. <https://doi.org/10.1177/1048291117691075>
- Wheeler, N., & Watts, N. (2018). Climate Change: From Science to Practice. *Current environmental health reports*, 5(1), 170–178. <https://doi.org/10.1007/s40572-018-0187-y>
- Lehmkuhl D. (2019). Das Thema Klimawandel und seine Bedeutung im Gesundheitssektor: Entwicklung, Akteure, Meilensteine [Climate change and its significance in the healthcare community: history, landmarks, and major players]. *Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz*, 62(5), 546–555. <https://doi.org/10.1007/s00103-019-02935-9>

- McGain, F., Muret, J., Lawson, C., & Sherman, J. D. (2020). Environmental sustainability in anaesthesia and critical care. *British journal of anaesthesia*, 125(5), 680–692. <https://doi.org/10.1007/s00103-019-02935-9>
- Dantés, Octavio Gómez, Sesma, Sergio, Becerril, Victor M., Knaul, Felicia M., Arreola, Héctor, & Frenk, Julio. (2011). Sistema de salud de México. *Salud Pública de México*, 53(Supl. 2), s220-s232. Recuperado en 16 de junio de 2022, de http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0036-36342011000800017&lng=es&tlng=es
- Código DF. (2021). Derecho a la salud. Retrieved from: <https://codigof.mx/en-mexico-33-millones-de-personas-sin-acceso-a-servicios-publicos-o-privados-de-salud-inegi/>
- Riojas-Rodríguez, Horacio, Schilmann, Astrid, López-Carrillo, Lizbeth, & Finkelman, Jacobo. (2013). La salud ambiental en México: situación actual y perspectivas futuras. *Salud Pública de México*, 55(6), 638-649. Recuperado en 16 de junio de 2022, de http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0036-36342013001000013&lng=es&tlng=es.
- CIEP. (2012). Cobertura Universal de la Salud en México: Requerimientos de infraestructura y equipamiento. Retrieved from: <https://ciep.mx/cobertura-universal-de-la-salud-en-mexico-requerimientos-de-infraestructura-y-equipamiento/>
- Patz, J. A., Frumkin, H., Holloway, T., Vimont, D. J., & Haines, A. (2014). Climate change: challenges and opportunities for global health. *JAMA*, 312(15), 1565–1580. <https://doi.org/10.1001/jama.2014.13186>

2022 AAHCI Student Leadership Initiative (ASLI)

The Role of Climate Change and Air Pollution in Neurodegenerative Diseases in the Context of Industrial Cities

TecSalud, Tecnológico de Monterrey (TecSalud) (Mexico)

AUTHORS

Vanessa Alegria-Saldivar, Medical Student; Alexa Bochm, Medical Student

PURPOSE

The effects of climate change are being felt all over the world, from displacing people from their homes, impacting agriculture and livestock practices to creating public health concerns. Air pollutants are part of the greenhouse effect, which contributes to the worsening of global warming.

It is known that air pollution is a major risk factor for the development of illnesses such as cardiovascular disease, breast cancer, and lung cancer. But the influence of the fine particulate pollutant in the context of neurological disorders, such as Alzheimer's disease, Parkinson's disease, strokes, etc., is poorly studied. Particles with a diameter of 2.5 microns or less, also known as PM2.5 are the result of fuel combustion from power plants and oil refineries, as well as mobile emissions. These particles can penetrate the alveolar walls and even crossing into the bloodstream, making their way into the brain, thus causing an inflammatory response which, in turn, causes oxidative damage. Over time, if there is an underlying neurological disease, the air particles can accelerate the disease progression or even initiate it.

INNOVATION

There are several proposals and a state environmental project that encourages the application of measures for emissions control and reduction. Although these programs exist to help reduce particulate emissions, the regulations must become stricter. The exposure that citizens have to pollutants is immoderate and, over time, can cause immense problems in public health.

IMPACT

As in many cities of Latin America, in Monterrey, Mexico, policies regarding air pollutant emissions by both industries and citizens were not regulated or even addressed until the consequences of high levels of air pollutants, as well as low air quality, started to cause concern.

We aim to research the effects of these PM2.5 particles (PM2.5 is the leading environmental cause of poor health and premature death) on neurological disorders, under current conditions and factors that are an ongoing problem for many cities in Latin America.

Our study is a proposal to identify and analyze the link between the rising incidence of hospital admissions in both private and public sectors on neurological disorders (such as stroke, dementia, cognition, depression, multiple sclerosis, etc.) and the air pollutants patients have been in contact with, so we can create a database that can help assess the neurological health risk of a person, depending on the exposures in their home environment.

Through medical research, while helping people, we also generate evidence that allows the creation of laws and mandates in our cities to combat climate change and to further strengthen the link between the consequences of climate change and global health.

References

- Gasca-Sanchez FM, Santos-Guzman J, Elizondo-Dueñez R, Mejia-Velazquez GM, Ruiz-Pacheco C, Reyes-Rodriguez D, Vazquez-Camacho E, Hernandez-Hernandez JA, Lopez-Sanchez RDC, Ortiz-Lopez R, Olvera-Posada D, Rojas-Martinez A. (2019) Spatial Clusters of Children with Cleft Lip and Palate and Their Association with Polluted Zones in the Monterrey Metropolitan Area. *Int J Environ Res Public Health*. 2019 Jul 12;16(14). pii: E2488. doi: 10.3390/ijerph16142488.
- Jesús Santos-Guzmán, Claudia Madrigal-Ávila, José Ascención Hernández- Hernández, Gerardo Mejía-Velázquez, Irma Elisa Eraña-Rojas, Leticia Elizondo-Montemayor, Luis Villela, (2014) Una década de monitoreo de plomo en sangre en niños escolares del área metropolitana de Monterrey, *NL Salud Pública de México*, [S.l.], v. 56, n. 6, p. 592-602, ISSN 1606-7916. Available at: <<http://saludpublica.mx/index.php/spm/article/view/7385/10505>>. doi:<http://dx.doi.org/10.21149/spm.v56i6.7385>.
- Hernández, J. A., López-Sánchez, R. C., & Rendón-Ramírez, A. (2016). Lipids and Oxidative Stress Associated with Ethanol-Induced Neurological Damage. *Oxidative medicine and cellular longevity*, 2016, 1543809. doi:10.1155/2016/1543809
- Wei, Y., Zhang, J., Li, Z., Gow, A., Chung, K. F., Hu, M., Sun, Z., Zeng, L., Zhu, T., Jia, G., Li, X., Duarte, M., Tang, X. (2016) Chronic exposure to air pollution particles increases the risk of obesity and metabolic syndrome: findings from a natural experiment in Beijing. *FASEB J*. 30, 2115–2122. www.fasebj.org
- Rosa del Carmen Lopez-Sanchez, Victor Javier Lara-Diaz, Alejandro Aranda-Gutierrez, Jorge A. Martinez-Cardona, and Jose A. Hernandez, (2018), HPLC Method for Quantification of Caffeine and Its Three Major Metabolites in Human Plasma Using Fetal Bovine Serum Matrix to Evaluate Prenatal Drug Exposure, *Journal of Analytical Methods in Chemistry*, Volume 2018, Article ID 2085059, <https://doi.org/10.1155/2018/2085059>
- Dean E. Schraufnagel, John R. Balmes, Clayton T. Cowl, Sara De Matteis, Soon-Hee Jung, Kevin Mortimer, BChir, Rogelio Perez-Padilla, Mary B. Rice, Horacio Riojas-Rodriguez, Akshay Sood, George D. Thurston, Teresa To, Anessa Vanker, and Donald J. Wuebbles, (2019), Air Pollution and Noncommunicable Diseases, A Review by the Forum of International Respiratory Societies' Environmental Committee, Part 2: Air Pollution and Organ Systems, *CHEST*; 155(2):417-426

2022 AAHCI Student Leadership Initiative (ASLI)

Weather Monitoring as a Tool to Improve Quality of Life

TecSalud, Tecnológico de Monterrey (TecSalud) (Mexico)

AUTHORS

Andrea Jimena Morales Arteaga, *Medical Student*; Gianelaa Sharón Pérez Fernández, *Medical Student*

PURPOSE

Climate change is often seen as an exclusively environmental problem, but, in reality, it has a direct impact on disease, particularly gastrointestinal infections. An increase in temperature generates modifications in the components of the environment that have consequences in population health, such as water and food quality, increased intensity of rainfall that leads to floods, changes in disease patterns, and massive migration to urban areas. The spread of a disease is determined by the environment. If the environment is altered, it may create a propitious impact on diseases that usually appear in tropical areas (The Lancet Infectious Diseases, 2021). Furthermore, it is essential to consider that developing countries, where the majority of older people live (United Nations, New York, 2007), might struggle with facing the constant variations that climate change represents in health. There is a lack of data that help health systems to be prepared accurately for what is to come with continued changes in temperature, especially data that could help improve approaches to disease in elderly people.

INNOVATION

Climate variability predisposes the population to certain diseases. Thus, a monitoring of its components (temperature, precipitation, and humidity) to better understand periods of high risk for elderly people in rural areas could help establish strategies that prepare health professionals to develop means that avoid potential collapses in health systems. Potential measurements include using space-time scan statistics, negative binomial regression, satellite precipitation estimates, and global atmospheric reanalysis. This methodology was previously used in Ethiopia, as noted in the study "Effect of Climate Variability on Childhood Diarrhea and Its High-Risk Periods in Northwestern Parts of Ethiopia" (Muluken Azage, et al. 2017). Focusing on the elderly in rural areas is crucial as the world's population continues to age.

IMPACT

This study will allow the development of well-established strategies, designed accordingly to the climate conditions of a particular country. Also, this helps improve the quality of life of the inhabitants of the country. In addition, it benefits the government, since it may represent a decrease in future expenses in health care through strategic investments, based on the high-risk periods from certain diseases.

References

- Azage, M., Kumie, A., Worku, A., C Bagtzoglou, A. y Anagnostou, E. (2017). Efecto de la variabilidad climática en la diarrea infantil y sus períodos de alto riesgo en el noroeste de Etiopía. PloS uno , 12 (10), e0186933. <https://doi.org/10.1371/journal.pone.0186933>
- United Nations, New York, (2007). El desarrollo en un mundo que envejece, reseña <https://fiapam.org/wp-content/uploads/2013/06/El-desarrollo-en-un-mundo-que-envejece.pdf>
- The Lancet Infectious Diseases. (2021, 12 January). Save our only planet. The Lancet Infectious Diseases, 12(21). 10.1016/S1473-3099(21)00720-9