4th Annual Online **Health Geography** Symposium 2025

**2025**

International Geographical Union
Commission on Health and the Environment (IGU CHE)

# 4th ANNUAL HEALTH GEOGRAPHY SYMPOSIUM

## ABSTRACT VOLUME

**Planetary Health: Mapping Our Shared Future**

iguche2022@gmail.com

# 4th Annual Online Health Geography Symposium for PhD and Emerging Researchers

4th Annual Online Health Geography Symposium 2025

International Geographical Union Commission on Health and the Environment (IGU CHE)

**10th DECEMBER 2025**
12:00 - 15:10 (CET)

**11th DECEMBER 2025**
12:00 - 15:30 (CET)

## Planetary Health: Mapping Our Shared Future

## Guidelines & Programme Schedule for the Participants

**The online symposium will be held via Microsoft Teams in one plenary room & four breakout sessions, 100+ participants, A keynote on Planetary Health and 57 presentations across diverse and related themes, including: Planetary Health || Urban Health || Migration and Health || Gender and Health || Climate Change and Health || Environment and Health || Infectious Diseases and Health || Health Geography. The program ends with a Publication discussion session featuring Editors, the Health Geography Award ceremony, and closing remarks by the commission chairs.**


The latest event information will be shared on the website http://www.healthgeography.org/che-hg-syposium.html.

All are welcome. You are encouraged to exchange ideas and engage with colleagues from around the world. Curiosity is fostered here, so do not hesitate to ask those bugging questions!

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International Geographical Union Commission on Health and the Environment (IGU CHE)

4th Annual Online Health Geography Symposium 2025

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International Geographical Union Commission on Health and the Environment (IGU CHE)

## ORGANIZING COMMITTEE

**Alexandra Cioclu**
University of Bucharest, Romania

**Manyu Amarasinghe**
European Public Health Master Programme Alumni

**Oluwaseun Ipede**
Jacobs Solutions, Georgia, USA

**Arindam Mondal**
Indian Statistical Institute, Kolkata, India

**Mariana Andreotti Dias**
State University of Rio de Janeiro - UERJ, Brazil

**Phoebe Eggleton**
GeoHealth Laboratory, University of Canterbury, New Zealand

**Asraful Alam**
Serampore Girls' College, University of Calcutta, India

**Marta Rodeschini**
University of Bergamo, Italy

**Priyanka Jha**
Jamia Millia Islamia, New Delhi, India & University of Cambridge, UK

**Cazacu Cristian**
University of Bucharest, Romania

**Matthew Hobbs**
Sheffield Hallam University, UK and University of Canterbury, New Zealand

**Sejal Gharde**
Savitribai Phule Pune University, Maharashtra, India

**Debaroti Das**
P.N.Das College, Palta, West Bengal, India

**Md Areful Hoque**
St. Xavier's College (Autonomous) Mahuadanr, Jharkhand, India

**Shahnaz Basheer**
Loyola College of Social Sciences, Kerala, India

**Eva Pilot**
IGU CHE, Maastricht University, Netherlands

**Narendra Kumar**
Hemvati Nandan Bahuguna Garhwal University, Uttarakhand, India

**Tiago Neiva Mesquita**
University of Coimbra, Portugal

**Haokun Liu**
University of Lausanne, Switzerland

**Oluwasegun T. Adetunde**
Tobler and Smith International Limited, Canada

**Varun Goel**
University of South Carolina, USA

**Zainul Abedin**
Jamia Millia Islamia, New Delhi, India

**ORGANIZER**

International Geographical Union Commission on Health and the Environment (IGU CHE)

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**Welcome to the 4th Annual Online Health Geography Symposium!**

Emerging scholars in Health and Health Geography bring fresh perspectives, innovative ideas, and an inspiring commitment to understanding the relationships between health, place, and people. Their work enriches the field and drives it forward in exciting new directions. Yet, despite this vibrant potential, emerging researchers often encounter obstacles when sharing their expertise and growing their academic profiles. Recognizing these challenges and the opportunities offered by an increasingly digital academic landscape the IGU CHE Health Geography Symposium was created as a virtual platform for meaningful exchange. Now in its fourth year, the symposium has become a well-established and warmly regarded event dedicated to supporting and elevating emerging researchers from around the world.

Our intention is simple yet powerful: to provide an open, accessible, and genuinely welcoming space where early career researchers can connect, network, and confidently share their work. The atmosphere of the symposium is intentionally kind, supportive, and community oriented an environment where constructive dialogue is encouraged, and every voice is valued.

By remaining fully online and free of cost, we aim to reduce barriers to travel, visas, safety, and accessibility, ensuring equal opportunities for participation regardless of geographical or personal circumstances. This commitment to inclusivity extends beyond the event itself. Each year, a public call invites students, PhD candidates, postdocs, and faculty members of all ages to join the organising team. Our group operates without hierarchy, embracing friendly, respectful collaboration and creating space for diverse perspectives to shape the event. Some of you may want to join next year's organising committee.

The primary goal of this year’s symposium is to continue building an open digital hub where emerging scholars can share their insights, engage in supportive discussions, and contribute actively to the evolving body of knowledge in Health Geography. We are delighted to welcome you into this community and look forward to the connections, conversations, and ideas that will emerge.

On behalf of the whole organising committee, **thank you for joining us. Your contribution enriches the symposium, and we’re excited to learn from you.**

Eva Pilot

Symposium Chair and Scientific Secretary of the International Geographical Union Commission on Health and the Environment

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# 4th Annual Online Health Geography Symposium for PhD and Emerging Researchers

4th Annual Online Health Geography Symposium 2025

International Geographical Union Commission on Health and the Environment (IGU CHE)

## Programme Overview

| Date | Time (CET) | Plenary Room | Breakout Room 1 | Breakout Room 2 | Breakout Room 3 | Breakout Room 4 |
|---|---|---|---|---|---|---|
| ***DAY- 1*** | | | | | | |
| **10th December 2025 (Wednesday)** | 12:00 - 12:10 | Welcome address & Opening Session | * | * | * | * |
| | 12:10 - 12:40 | Key Note: Planetary Health | * | * | * | * |
| | 12:50 - 13:50 | * | Planetary Health | Urban Health | Gender and Health | Climate Change and Health |
| | 13:50 - 14:00 | **Break** | | | | |
| | 14:00 - 15:00 | * | Environment and Health | Infectious Diseases and Health | Migration and Health | Health Geography |
| | 15:00 | Closing Session | * | * | * | * |
| ***DAY- 2*** | | | | | | |
| **11th December 2025 (Thursday)** | 12:00 - 12:10 | Welcome | * | * | * | * |
| | 12:10 - 13:10 | * | Planetary Health | Urban Health | Gender and Health | Urban Health & Health Geography |
| | 13:10 - 13:20 | **Break** | | | | |
| | 13:20 - 14:20 | * | Environment and Health | Environment and Health & Health Geography | Health Geography | Health Geography |
| | 14:20 - 15:00 | Publication Discussion with Journal Editors | * | * | * | * |
| | 15:00 - 15:10 | Health Geography Prize | * | * | * | * |
| | 15:10 - 15:30 | Closing Session | * | * | * | * |

* Breakout rooms are closed

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International Geographical Union Commission on Health and the Environment (IGU CHE)

## PROGRAMME SCHEDULE

**How to access the Symposium:** Enter the **Microsoft Teams** link below. You will be directly in the plenary room. You can assist with the event taking place in the plenary or go to a breakout room.

**Join the symposium 10 minutes before the start!**

**Online Link and access details you need:**

https://teams.microsoft.com/l/meetupjoin/19%3ameeting_ZDBjNmE3ODktZjc3ZS00ZWU3LWIxZjUtMTNhZjA2OTBhMWZh%40thread.v2/0?context=%7b%22Tid%22%3a%2263ac4101-dd05-4771-bcd6-2e2a5421e5fa%22%2c%22Oid%22%3a%223f4a52b5-ddce-4266-911d-f0f14e8bc575%22%7d

Meeting ID: 310 866 117 789 63 Password: 3jg6Mj6j

### *10th December (Wednesday), 2025*

| Time (CET) | | |
|---|---|---|
| **12:00 - 12:40** | **OPENING SESSION** | |
| **Plenary room** | Eva Pilot<br>Symposium Chair | Welcome address and remarks on behalf of<br>International Geographical Union (IGU) Commission on Health and the Environment |
| | Key Note<br>Roger Frutos | Anthropogenic Planetary alteration and infectious diseases |
| **12:50 - 13:50** | **SESSION - 1** | |
| **Breakout Room 1** | **Planetary Health**<br>**Chair:** Matthew Hobbs | **Planetary Health in Respect to Global Sustainability: Challenges and Pathways**<br>*Deepa Ghosh, Vidyasagar University, Medinipore,west Bengal, India.*<br><br>**Cultural Heritage and Urban Transformation: A Geographical Interpretation of Ajmer's Historic Core in the Context of Planetary Well-Being**<br>*Himani Pathariya, Research Scholar, Banasthali Vidyapith, Rajasthan, India.*<br><br>**Listening to Earth's Vital Signs in the 21st Century: From Crisis to Cure**<br>*Vijay Laxmi, University of Kota, Rajasthan, India.*<br><br>**Exploring the relationship between climate change and water scarcity**<br>*Bhavya Sree Sirikonda, School of Design, Alliance University, India* |

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| **Breakout Room 2** | **Urban Health**<br>**Chair:** Shahnaz Basheer | **Local food governance: the role of local government in enabling healthy, food resilient communities**<br>*Cassie Welch, University of Otago, New Zealand*<br><br>**How does aviation development affect urban health? Evidence from dual machine learning**<br>*Chen Peng, East China Normal University, China*<br><br>**An analysis of environmental risk factors for hypertension in Kaduna Metropolis**<br>*Babaraus Doyani, Gokhale Institute of Politics and Economics, Pune, India.*<br>**Socio-economic determinants of urban health in Ranchi: an integrated health geography perspective**<br>*Shephali Prakash, St. Xavier's College Autonomous Mahuadanr, Latehar, Jharkhand , India.* |
| **Breakout Room 3** | **Gender and Health**<br>**Chair:** Debaroti Das | **Transport Exclusion and Maternal Health: Evidence from Pregnant Women in Oyo State, Nigeria**<br>*Olabisi Olapoju, Obafemi Awolowo University, Ile-Ife, Nigeria*<br><br>**A Cross-Sectional Study of Menstrual Hygiene Practices and Beliefs Among Adolescent Girls at Higher Secondary Level in Selected Schools of Rural, Semi Urban and Urban Regions of Palakkad District, Kerala, India**<br>*Sreelakshmi Sreekala, Department of Geography, Govt Arts and Science College,University of Calicut, Kerala, India*<br><br>**Occupational Health Hazards and Socio-Economic vulnerability among tribal Women Bricks Kiln Workers in Latehar district of Jharkhand (India): A Case Study**<br>*Dr. Md Areful Hoque, St. Xavier's College (Autonomous) Mahuadanr Jharkhand, India*<br><br>**Rural-Urban Differentials in Maternal Healthcare Services Utilization in Sub-Saharan Africa**<br>*Yemi Adewoyin, University of Nigeria, Nigeria.* |
| **Breakout Room 4** | **Climate Change and Health**<br>**Chair:** Asraful Alam | **Assessment of Microclimatic and Ecological Conditions and Their Influence within The Kabba Development Corridor**<br>*Saliu Oludare Abubakar, Kogi State University, Kabba, Nigeria.*<br><br>**Cartographic insights present in international heat-health plans (2021-2025)**<br>*Caio Leal, Laboratory of Geography, Health and Environment, University of Brasília, Brazil.*<br><br>**Healing Traditions and Climate Change: A Systematic Review of Tibetan Medicine in Monpa Community**<br>*Smriti Shreya, Jamia Millia Islamia, A Central University, India.* |
| **13:50 – 14:00** | **BREAK** | |
| **14:00 - 15:00** | **SESSION - 2** | |


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|---|---|---|
| **Breakout Room 1** | **Environment and Health**<br>**Chair:** Narendra Kumar | **Intersecting Inequalities: Socio-economic Determinants and Health Vulnerabilities among Tribal Communities in Jharkhand- A Micro-level Analysis of Mahuadanr**<br>*Rozy Tirkey, St. Xavier's College (Autonomous), Mahuadanr, Jharkhand, India*<br><br>**Health Seeking Behaviour among the Tribal Communities along South Kashmir: A Socio-Cultural and Geographical Perspective**<br>*Nazim Nazir, University of Mumbai, India.*<br><br>**Health Care After a Disaster: The Case of the 2016 Earthquake in Central Italy**<br>*Annamaria Bartolini, University of Perugia, Italy.*<br><br>**Hypertension and Environmental Risk Analysis in Makurdi Metropolis**<br>*Azahan Christopher, Bayero University, Kano, Nigeria.* |
| **Breakout Room 2** | **Infectious Diseases and Health Geography**<br>**Chair:** Priyanka Jha | **Where Did the Pandemic Arrive First? Spatial Diffusion Analysis of COVID-19 in Brazil**<br>*João Lima, Sao Paulo State University (UNESP), Brazil*<br><br>**Spatio-Temporal Dynamics of COVID-19 Vulnerability Among Elderly Populations: A Neighborhood-Level Analysis in Curitiba, Brazil**<br>*Karina Matos, Federal University of Paraná, Brazil*<br><br>**Estimating Malaria Fever Risk in West Bengal, India using Space-Time Conditional Autoregressive Model**<br>*Meghna Maiti, Senior Research Scholar, University of Calcutta, India.*<br><br>**Prevalence and Analysis of Fluorosis: A case study of West Bengal**<br>*Keshav Prakash Pandey, Department of Geography, Institute of Science, Banaras Hindu University, Varanasi. India.* |
| **Breakout Room 3** | **Migration and Health**<br>**Chair:** Asraful Alam | **Emerging Trends of Internal Migration and Associated Health Challenges in Sub-Saharan Countries: Nigeria in Perspective**<br>*Adeniyi Gbadegesin, Independent Researcher, Nigeria.*<br><br>**Determinants of Health Outcomes among Rural-to-Urban Student Migrants: A Quantitative Analysis**<br>*Nur Alam, Aliah University, India.* |

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| **Breakout Room 4** | **Health Geography**<br>**Chair:** Alexandra Cioclu | **Spatial analysis of acute respiratory infection associated with indoor air pollution and socio-economic condition: case of Punjab Pakistan**<br>*Maheen Iftikhar, Islamia university Baghdad ul jaded campus Bahawalpur,Pakistan.*<br><br>**Health Infrastructure Disparities in Jharkhand: An Inter-District Analysis for achieving SDG 3 by 2030**<br>*Zainul Abedin, Jamia Millia Islamia, New Delhi, India.*<br><br>**Determinants of Contraceptive Behaviours by Residence in South-Eastern Nigeria: A Descriptive Approach**<br>*Precious Eni, University of Calabar, Calabar, Nigeria*<br><br>**Geo- Spatial Evaluation of Child Malnutrition In Jigawa State**<br>*Khalifa Mukhtar Usman, Department of Science, Geography Unit Jigawa State College of Remedial and Advanced Studies Babura, Nigeria.* |
| **15:00** | **CLOSING FOR THE DAY** | |

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***11th December (Thursday), 2025***

***Time: 12:00-15:00 CET***

| **Time (CET)** | **OPENING SESSION** | |
|---|---|---|
| **12:00 - 12:10** | | |
| **Plenary Room** | Eva Pilot<br>Symposium Chair | Welcome and overview of the day by International Geographical Union Commission on Health and the Environment (IGU CHE) |
| **12:10 - 13:10** | **SESSION - 3** | |
| **Breakout Room 1** | **Planetary Health**<br>**Chair:** Zainul Abedin | **Urbanisation and Ecosystem Resilience: A Three-Decade Assessment of Delhi's Blue-Green Spaces (1991-2023)**<br>*Priyanka Jha, Jamia Millia Islamia (A Central University), New Delhi, India and University of Cambridge, Cambridge, UK*<br><br>**Assessing Ecosystem Health and Landscape Dynamics of the East Kolkata Wetlands, India**<br>*Pawan Kumar Yadav, Jamia Millia Islamia (A Central University), New Delhi, India.*<br><br>**Invisible Threats: Air Pollution and Respiratory Health in Kolkata's Urban Landscape**<br>*Ipsa Datta, School of Design, Alliance University, India.*<br><br>**Green Building Practices for Urban Health: Climate-Responsive Design and Energy Efficiency in Densely Populated Cities**<br>*Sai Sharan B, School of Design, Alliance University, India.* |
| **Breakout Room 2** | **Urban Health**<br>**Chair:** Haokin Liu | **Urban Health Vulnerabilities: A Spatial Analysis of water borne diseases in Delhi**<br>*Rahul Raturi, Student, Shaheed Bhagat Singh College, University of Delhi, India.*<br><br>**Municipality supplied water quality assessment and Human Health exposure in Borough -II, Asansol Municipality Corporation, India**<br>*Shakchhi Kumari, Trivenidevi Bhalotia College, Raniganj, West Bengal, India.*<br><br>**Environmental Impacts on Human Health in Dehradun City**<br>*Neha Rani, Hukum Singh Bora Govt. P.G College, Someshwar Almora (Uttarakhand), India* |

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| **Breakout Room 3** | **Gender and Health**<br>**Chair:** Debaroti Das | **Listening to the Living, Counting the Dead, and Mapping Absences: Feminist Geographical Reasoning as Disobedience in Brazilian Health Geography**<br>*Carolina Simon, São Paulo State University, Brazil.*<br><br>**Perceived Discrimination and Healthcare Avoidance among Women: A Qualitative Exploration - A Case of Kolkata**<br>*Moumita Kundu, Serampore Girls College, India.*<br><br>**Inequality between Roma and majority ethnic groups in terms of access to healthcare**<br>*Mihaela Georgiana Olteanu, Școala Doctorală Simion Mehedinți, Romania.* |
| **Breakout Room 4** | **Urban Health and Health Geography**<br>**Chair:** Mariana Andreotti Dias | **Urban Walkability, Health and the Elderly: Evidence from Delhi**<br>*Abhinav Kumar Mishra, Jawaharlal Nehru University, India.*<br><br>**Transit-Oriented Obesogenic Development in Delhi Metro: Mapping Junk Food and Urban Health Risks**<br>*Shehnaz Begam, Jamia Millia Islamia, New Delhi,India*<br><br>**Urbanization, River Health, and Human Exposure: A Zonal Study of the Mahananda in Crisis- A Case of West Bengal, India**<br>*Abhishek Rao, Assistant Professor, School of Design, Alliance University, India.* |
| **13:10 - 13:20** | **BREAK** | |
| **13:20 - 14:20** | **SESSION - 4** | |

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|---|---|---|
| **Breakout Room 1** | **Environment and Health**<br>**Chair:** Tiago Mesquita | **Environmental Pollution and Human Health: Assessing Microbial Pollution and Disease Prevalence in the East Kolkata Wetlands**<br>*Liyakat Ali, Department of Geography, Aliah University, Kolkata, India*<br><br>**Urban EcoScore Index-Based Assessment of Biophilic Conditions and Natural Habitability of Kolkata Metropolitan Area using Enhanced Indices and Machine Learning**<br>*MD SAHARIK Joy, Jamia Millia Islamia (A Central University), New Delhi, India*<br><br>**Traditional Water Sources in Chamoli District: The Importance of Naula and Dhara**<br>*Pawan Singh, HNBGU Srinagar Garhwal Uttarakhand, India.*<br><br>**Can local farms sustain Thai school lunches? A qualitative exploration of challenges and solutions**<br>*Panrawee Praditsorn, Center for Development Research, University of of Bonn, Germany.* |
| **Breakout Room 2** | **Environment and Health**<br>**&**<br>**Health Geography**<br>**Chair:** Cazacu Cristian | **Unmet need for Caesarean section deliveries in Akure, South-Western Nigeria, a reality or a myth**<br>*Oluwasegun T Adetunde, Tobler and Smith International Limited, Canada*<br><br>**Ecological and Human Health Risk Assessment of Heavy Metal Contamination and Its Impact on Antioxidant Enzyme Activity in Rainbow Land Crab (Cardisoma armatum) from Western Lagos Lagoon, Nigeria**<br>*Olayiwola Giwa, Bayero University Kano, Nigeria* |
| **Breakout Room 3** | **Health Geography**<br>**Chair:** Md Areful Hoque | **Geospatial Inequalities in Access to Primary Healthcare in Rural Gombe State, Nigeria**<br>*Nafisat Auwal, Department of Geography and Environmental Management, Gombe State University, Gombe , Nigeria*<br><br>**An Analysis of Spatial Distribution of Stroke, Hypertension, Congestive Cardiac Failure, dilated Cardiomyophathy And Post Partum Cardiomyopathy In Kano Metropolis Nigeria**<br>*Mohammed Buba Hassan, Federal University Gusau, Nigeria.*<br><br>**Theater as an inclusive space: A study on accessibility and therapeutic potential for people with physical disabilities**<br>*Carmen-Ileana Dobrescu, Faculty of Geography, Doctoral School "Simion Mehedinți", University of Bucharest, Romania.*<br><br>**Correlation of Stress and Academic Achievement Among Higher Secondary Level Students at Selected School in Tholannur, Palakkad District, Kerala, India**<br>*Surya Palappath Thannikandam, Department Of Geography, Govt Arts and Science College, University of Calicut, Kerala, India* |

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| **Breakout Room 4** | **Health Geography**<br>**Chair:** Matthew Hobbs | **Invisible Inequalities: Maternal and Child Health Challenges in Marginalized Communities of Rajasthan in 21st Century**<br>*(Ms.) Gagan Tanwar , Research Scholar, University of Kota, Kota, Rajasthan, India*<br><br>**Using geospatial analysis to identify gaps in metropolitan healthcare services accessibility**<br>*Cristian Cazacu, Faculty of Geography, University of Bucharest, Romania.*<br><br>**Mapping High School Commutes: Living in Education Deserts and Its Effect on the Population.**<br>*Angelo Andi Petre, Faculty of Geography, University of Bucharest, Romania.*<br><br>**The Uneven Geography of Healthcare in Maharashtra, India: A Socio-Spatial Analysis of Inequalities**<br>*Komal L Turkar, Department of Geography, Savitribai Phule Pune University, India.* |
| **14:20 - 15:30** | **Closing Session** | |
| **Plenary Room** | Eva Pilot<br>Symposium Chair | Meeting with Editors: Publication Discussion with Susan Elliot and Sebastien Fleuret<br><br>Varun Goel will present Health Geography Prize<br><br>Closing remarks on behalf of International Geographical Union (IGU) Commission on Health and the Environment will be held by Rafael de Castro Catão & Liliana Dumitrache (Co-Chairs of the Commission) |

## Practical information

### How to access:

Enter the **Microsoft Teams** link below. You will be directly in the plenary room. You can assist with the event taking place in the plenary or go to a breakout room.

### Online Link and access details:

**Join the symposium 10 minutes before the start**

https://teams.microsoft.com/l/meetupjoin/19%3ameeting_ZDBjNmE3ODktZjc3ZS00ZWU3LWIxZjUtMTNhZjA2OTBhMWZh%40thread.v2/0?context=%7b%22Tid%22%3a%2263ac4101-dd05-4771-bcd6-2e2a5421e5fa%22%2c%22Oid%22%3a%223f4a52b5-ddce-4266-911d-f0f14e8bc575%22%7d

Meeting ID: 310 866 117 789 63

Password: 3jg6Mj6j

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## How to work with the Microsoft Teams platform:

Although you can connect virtually with **Microsoft Teams** Meetings without installing the software, we do recommend that you download and install it. No registration or fee is required for you to join a meeting via **Microsoft Teams**.

If you are not familiar with the platform, kindly see the following videos to learn the basic controls (e.g., navigate between breakout rooms, share screen, switch on/off mic and camera):

- Joining a **Microsoft Teams** Meeting via link: https://youtu.be/xBuEiGActgQ?si=etIEcWTjbZWrQGDs
- Screen Sharing (for presenters): https://youtu.be/nqT59hoky04?si=ZI84pS8u4rQnDlVn
- Breakout rooms: https://youtu.be/ilUdDZ2QPvc?si=V43_BVIJsCZr8vLu

## Guidelines for presenters:

- Each presenter has a fixed time for their presentation, 10 minutes for the presentation, followed by a 5-minute question and answers/comments session.
- Presenters (1st Author only) are encouraged to use their time wisely. Each plenary session will be overseen by a chair responsible for coordinating the session. Additionally, a senior scientist will be present to facilitate discussions.
- The presenter's name is mentioned in the programme schedule; authors and co-authors will be included in the Abstract Volume.
- Details of the presentations should include a **problem statement, research methodology, study findings/results/implications, and conclusion**.
- Presenters must make their presentations (in PDF format) available to the conference organizers via email (iguche2022@gmail.com) on or before Monday, **8th December 2025, 12:00 noon CET.**
- Certificates will be provided to the **paper presenters only** after the symposium, which will be sent to your designated email address.
- Presenters will receive feedback forms at the end of the symposium (Please provide your full name, as it will be displayed on the certificate). Kindly take a moment to fill them out, as your input is highly valuable.
- Confirm your internet connection and video and audio settings prior to your session.
- Should you have any questions, do not hesitate to contact us at iguche2022@gmail.com

**We look forward to seeing you all soon!**

IGU UGI International Geographical Union Commission on Health and the Environment (IGU CHE)


## Organizing Committee Contact details :

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IGU UGI International Geographical Union Commission on Health and the Environment (IGU CHE)

# Session 1

## *Parallel Session 1: Planetary Health*

### Planetary Health in Respect to Global Sustainability: Challenges and Pathways

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In a global perspective the concept of planetary health being considered by several factors including present global threats in terms of environmental vulnerability, to be more precise issues like climate change, deforestation, biodiversity loss, emergence of infectious diseases like COVID 19, rapid environment pollution and so on. Planetary health represents an evolving interdisciplinary framework that seeks to understand and address the dynamic interrelation between environmental system and human well-being. The key focus of planetary health depicts in the transformation and rapid changing of the planet Earth and human health. Planetary health incorporate solution-oriented analysis and ways that anthropogenic disruptions to Earth's natural systems on plants and animals health including humans. Planetary health incorporate a mindful study to secure the current ecological and anthropogenic conditions.

During the phase of COVID19 pandemic the whole world witnessed the uncertainty as well as the vulnerability in terms of people's health. The COVID 19 pandemic profoundly influenced planetary health by revealing interdependence between human and environment. It exposed the vulnerabilities in public health infrastructure and highlighted the unequal access to healthcare across the globe. By investing in the green recovery strategies and addressing climate change remains relevant for achieving resilient and sustainable health systems in the post pandemic timeframe. One can not think their health without the surrounding environment. In the period of COVID 19 the exponential increase in use of disposable masks, gloves, plastic packaging generated massive amount of biomedical and non biodegradable waste materials which triggered directly in the terrestrial and marine life. Thus, it becomes important to re-evaluate the humanity's in relationship with the nature in the post COVID world.

Achieving planetary health requires cross-sectoral collaboration among government, scientists, NGOs and communities. Planetary health demands systematic transformation towards sustainable living. Planetary health effected by constantly changing environment, social and economic factors. Evidence-based short term and long term analysis can help to identify gaps in interventions and policy making which leads to more superficial and effective solution.

Over the past century, human progress driven by high industrialization, globalization and urbanization that has significantly improved the lifestyle of common people. On the other hand this progress has come at the cost of unprecedented environmental degradation and

the system breakdown. Ensuring planetary health means ensuring equity and sustainability for present and future generations.
The future will witness awareness from youth movements as well as indigenous people whose traditional ecological knowledge will become crucial for preserving planetary balance.

**Keywords:** Planetary health, Sustainability, Climate change, COVID 19, human health

## Cultural Heritage and Urban Transformation: A Geographical Interpretation of Ajmer's Historic Core in the Context of Planetary Well-Being

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The historic core of Ajmer presents a distinctive cultural landscape where architecture, religious traditions, community interactions, and spatial organization have evolved together over centuries. Heritage landmarks such as the Dargah Sharif, Taragarh Fort, Adhai Din Ka Jhopra, Mayo College, and the Akbari Fort & Museum continue to shape the cultural identity and lived experience of residents and visitors. This study examines how these heritage elements influence the city's urban form, patterns of public movement, street morphology, land use, social relations, and everyday cultural practices.
Linked to the perspectives of health geography, the research recognizes cultural heritage as an essential dimension of planetary health, where the well-being of communities is connected to sense of identity, belonging, place attachment, environmental quality, and cultural continuity. The physical environment of historic neighborhoods, including narrow streets, pedestrian zones, shared public spaces, and ritual movement patterns, affects social cohesion, psychological comfort, and collective memory, all of which contribute to community well-being. At the same time, increasing tourism, commercialization, and unplanned development pose pressures on both heritage structures and the social fabric of the historic core.
The research uses spatial mapping, field observations, photographic documentation, interviews with residents and local stakeholders, and interpretation of historical records to explore these relationships. The study aims to understand how heritage-rich urban environments can support healthier and more resilient communities when planning is culturally sensitive and environmentally aware. The findings highlight the importance of incorporating cultural heritage into sustainable urban development strategies, not only as a matter of preservation but as part of broader goals of social and environmental well-being.
The study contributes to ongoing discussions in health geography by demonstrating that cultural heritage landscapes are not only historical sites but also lived environments that shape emotional security, cultural identity, and community resilience—key components of planetary health.

**Keywords:** Planetary Health; Cultural Heritage; Urban Morphology; Health Geography; Community Wellbeing; Sustainable Urban Planning; Historic Core.

# Listening to Earth's Vital Signs in the 21st Century: From Crisis to Cure

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If Earth were our patient, the prognosis across time would be alarming. Over the last century, human health has improved, but planetary health has deteriorated—two trajectories moving in opposite directions (Myers, 2017). Just as physicians use vital signs, planetary health mapping relies on indicators such as air and water quality, climate stability, and resource availability to monitor the well-being of our shared home. The results are clear: past neglect has culminated in present crises, and without intervention, future risks will multiply.

In complex, interconnected systems, what humanity has done to the environment inevitably returns to shape our destiny—often in disproportionate and unexpected ways. The disruption of ecological balance is not only degrading ecosystems but also threatening decades of public health progress. Symptoms are already evident: antimicrobial resistance, toxin exposure, malnutrition, respiratory diseases like asthma and COPD, heat stress, cardiovascular illness, and shifting infectious disease patterns. Beyond physical impacts, planetary decline leaves deep social and psychological scars—civil strife, displacement, trauma, and an escalating mental health burden.

To diagnose without treating is negligence. A timeline of planetary health reveals that the industrial past sowed ecological imbalance, the present demands urgent response, and the future requires collaborative resilience. Addressing these challenges necessitates massive cooperation across disciplines, sectors, and nations. Health geography is uniquely positioned to chart these inter linkages, mapping vulnerabilities while also highlighting resilience within human–environment systems. By embracing planetary health mapping, we gain not just a diagnostic tool but also a compass guiding us toward equity, sustainability, and survival.

This symposium calls upon emerging researchers to reimagine Earth not as an infinite resource but as a fragile patient whose recovery depends on us. Our task is urgent: to heed the planet's vital signs across past, present, and future, to prescribe bold solutions, and to heal the fractures in our shared future. Safeguarding human health is inseparable from safeguarding planetary health—and our collective response today will determine the well-being of generations to come.

**Keywords:** Planetary Health, Climate Change, Public Health, Resilience, Sustainable Future.

# Exploring the relationship between climate change and water scarcity

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Relationship between Climate change and water scarcity is directly proportional. Why does climate change occur? What are the reasons for climate change? What are the problems that occur because of climate change? Is climate change related to water scarcity? How can we prevent water scarcity? Are water scarcity and climate change universal issues? How is water scarcity related to climate change? What are the methods/techniques that help in controlling climate change and water scarcity? Does all this impact human life?

Climate and water have an inseparable bond. Climate change affects water in many ways. Like over precipitation, melting of glaciers, rising of sea level, floods, and droughts. Most impacts of climate change come down to water. Climate change might either create water scarcity or water-related hazards. Many people around the world are facing a shortage of safe drinking water. Around 74 percent of natural disasters between 2001 and 2018 were water-related. Disasters might contaminate water supplies, increase the risk of diseases like cholera and typhoid, increase in temperature might lead to deadly pathogens in freshwater sources. Over the past two decades, water-related disasters are often seen. Disasters impact very badly on health, infrastructure, environment, habitat, ecosystem, and economy. To overcome these issues, International treaties took place. The Kyoto Protocol was the first international treaty that happened to decrease global warming and slow down climate change. The main motto of this protocol is to reduce greenhouse gases. Developed countries have agreed to decrease about 5% of greenhouse emissions. Kyoto protocol increased global awareness about environmental responsibility and became an inspiration for future agreements. The Paris Agreement was made at the United Nations Climate Change Conference in Paris, France. In this agreement, unlike Kyoto Protocol every country is included to cut greenhouse gas emissions. Main motto of this agreement is to limit global temperature rise by 2°C and prevent worst effects of climate change. Paris agreement represents Global unity toward preventing climate change. Sustainable water management will help a lot to control water scarcity and protect the natural ecosystem. Implementation of water-efficient agricultural practices, promoting water reuse, recycling, and investing in infrastructure that manages water resources better. Hydroponics method can be implemented in urban areas to grow plants without soil by only using water and some minerals. Vertical farming is similar to hydroponics, which is best to grow plants in urban areas, which saves space and reduces transport costs. Usage of renewable energy resources should be decreased and can be replaced with solar, wind, or any other natural energies. These are some of the helpful preventive measures. Implementation of all these will help in maintaining planetary health.

# Session 1

## *Parallel Session 2: Urban Health*

### Local food governance: the role of local government in enabling healthy, food resilient communities

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Integrated food policies and local food governance can provide better outcomes for the health of the population and the environment; however, Aotearoa does not have clear direction from central government around food policy and governance, which presents a considerable gap for local governments to navigate. This research explores the strategies, activities and actions that local governments are engaged in within their local food systems, as well as potential opportunities and future directions for place-based food governance across four case study areas. Based on the conceptual frameworks of place (context and place-based factors) and One Health (relational understanding of health), it identifies how local governments engage in food governance, what motivations drive their engagement, the barriers and constraints to their engagement, and the expectations of outcomes. Local food governance is considered and examined across three key spheres: policy (strategic plans), polity (institutional architecture), and politics (political power and will), drawing on the triangle of governance framework to support an analysis of the relational dynamics of governance. By comparing different case study examples across Aotearoa New Zealand, this research highlights local government's common challenges and complexities, as well as the benefits and value of local government engaging in local food governance in Aotearoa New Zealand.

**Keywords:** local government; food governance; place; one health; case study

### How does aviation development affect urban health? Evidence from dual machine learning

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Based on panel data from 284 prefecture-level and higher-tier cities in China (2007–2019), this study systematically assesses the impact of air route openings on urban health outcomes. Grounded in the framework of health demand theory and the health production function, this paper constructs a multidimensional urban health evaluation system encompassing five dimensions: healthcare capacity, economic foundation, cultural development, ecological environment, and social services. It further employs a dual machine learning model to

analyze the effect of air route openings on urban health. The results demonstrate that air route openings significantly improve urban health outcomes, with their effect on enhancing healthcare capacity being particularly prominent. Mechanism analysis indicates that air route openings influence urban health primarily through three channels: promoting economic growth, optimizing the allocation of medical resources, and exerting a moderate inhibitory effect on green technology innovation. Heterogeneity analysis further reveals that air route openings exert a more significant health-promoting effect in non-resource-dependent cities, cities in old industrial bases, and cities in the central and western regions of China. Additionally, an increase in the degree centrality of air networks not only significantly boosts overall urban health but also exerts positive impacts on multiple dimensions, including economic foundation, ecological environment, social services, and healthcare capacity—though its promoting effect on cultural development is statistically insignificant. Unlike the potential environmental pressures associated with air route openings, greater air network connectivity generates net positive ecological effects. This study's findings highlight the unique role of air transport in advancing urban health and offer important implications for optimizing the layout of China's air network, enhancing urban public health, and designing targeted health policies.

## An analysis of environmental risk factors for hypertension in Kaduna Metropolis

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Hypertension remains one of the most prevalent non-communicable diseases in Nigeria and a growing cause of morbidity and mortality in Kaduna metropolis. It has become one of the emerging leading public health concerns in the study area, with the rising prevalence linked not only to traditionally emphasized lifestyles and genetic predispositions but also to environmental exposures that highlights the critical role of environmental risk factors in the development and progression of hypertension. This study objective seeks to analyze environmental risk factors associated with hypertension in Kaduna metropolis. A cross-sectional design was employed, involving 768 sample size adults selected through multistage sampling techniques across different urban settlements group in to clusters. Data were collected using structured questionnaires, literatures review, clinical records of blood pressure measurements and environmental assessments. Statistical analyses were performed with SPPS software v23 using descriptive statistics, correlation and logistic regression to determine associations between environmental factors and hypertension prevalence. Arc-GIS 10.8 software was also used for point maps production for cases of hypertension prevalence and other operational analysis Findings revealed 41.95% prevalence among respondents, with 77.73% reporting a close relative diagnosed with the condition, indicating a substantial burden in the study area. Environmental risk factors were prominently linked to elevated risks: 30.6% of participants identified high noise pollution (from residential and industrial sources) as the primary contributor, followed by poor housing conditions (24.2%), exposure to poor air quality (23.6%), water pollution or poor water quality

(13.4%), and limited access to green spaces (8.2%). Other factors such as proximity to traffic-congested areas, climate (temperature extremes) and occupational stress environments also showed notable correlations. Logistic regression confirmed strong positive associations, suggesting that cumulative environmental exposures amplify hypertension risks independently of individual behaviors or genetics. These results emphasize that environmental determinants significantly exacerbate hypertension in Kaduna, advocating for a paradigm shift in public health approaches. The study recommends multisectoral policy responses, involving collaboration among the Ministry of Health, non-governmental organizations, urban planners, decision-makers, communities, and health practitioners. Integrating environmental health into hypertension management through targeted interventions like noise regulations, air quality improvements, and green space enhancements could mitigate modifiable risks and reduce the disease burden. Ultimately, this research calls for comprehensive, evidence-based strategies to address the interplay of environmental factors in urban health challenges, promoting sustainable well-being in rapidly growing Nigerian cities.

**Keywords:** Hypertension, Public health, Environmental risk factors, Urban health, Kaduna metropolis.

## Socio-economic determinants of urban health in Ranchi: an integrated health geography perspective

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Urban health is increasingly recognized as a key dimension of sustainable city development, particularly in rapidly growing urban centers like Ranchi, Jharkhand. The dynamic process of urbanization in Ranchi has led to socio-economic transformations that directly and indirectly influence the health status of its residents. This study examines the socio-economic determinants shaping urban health outcomes through an integrated health geography perspective. The primary objective is to analyze how factors such as income, education, occupation, housing condition, sanitation, and access to healthcare services affect the overall well-being of the urban population. The research utilizes both household-level information and secondary data sources, including Census of India (2011), National Family Health Survey (NFHS-5), and municipal health department reports. Findings reveal that lower-income groups, residents of informal settlements, and individuals with limited educational attainment experience higher morbidity rates and poorer access to quality healthcare. Environmental conditions such as inadequate sanitation, water scarcity, and air pollution further aggravate urban health disparities. The study emphasizes that improving socio-economic conditions, strengthening primary health infrastructure, and promoting equitable urban planning are essential to achieving healthier and more resilient urban communities. The paper concludes with policy recommendations aimed at fostering inclusive and sustainable urban health strategies tailored to the unique context of Ranchi.

**Keywords:** Urban Health, Socio-Economic Determinants, Health Inequality, Ranchi, Health Geography, Urbanization.

# Session 1

## *Parallel Session 3: Gender and Health*

### Transport Exclusion and Maternal Health: Evidence from Pregnant Women in Oyo State, Nigeria

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Transport exclusion is a critical dimension of social exclusion, particularly in resource-constrained settings where access to healthcare services depends heavily on mobility. This study examines the factors of transport exclusion among pregnant women in three Local Government Areas (Ibadan North, Ibadan Northeast, and Ibadan Northwest) of Oyo State, Southwestern Nigeria. Using a stratified sampling approach, 357 pregnant women were selected from federal, state, primary healthcare, and private hospitals. Data were collected through structured questionnaires that covered socio-demographic attributes, travel needs, transport choices, and barriers to accessibility. The data were analyzed using descriptive statistics and Pearson correlation analysis. Findings indicate that visits to health centres (99.7%) and religious centres (98.3%) dominate travel needs, underscoring the centrality of healthcare and social participation in women's daily mobility. Motorcycles (90.2%) emerged as the most commonly used transport mode, largely due to their affordability, accessibility, and flexibility, while walking and tricycles were also significant. The main factors influencing transport choice were accessibility (95%), safety and security (86.3%), reliability (84%), convenience (79%), and weather (73.9%). However, critical barriers to mobility included lack of money (95%), environmental challenges (86.3%), physical appearance due to pregnancy (84%), fear-based concerns related to road safety (79%), and discrimination from drivers and commuters (73.9%). The results highlight how financial deprivation, unsafe infrastructures, and socio-cultural biases combine to limit pregnant women's access to essential maternal services, thereby reinforcing health inequalities and vulnerability to adverse pregnancy outcomes. The study concludes that promoting inclusive transport policies, through improved affordability, safety, and gender-sensitive mobility options, is imperative for enhancing maternal health outcomes and reducing social exclusion. These findings provide evidence-based insights for policymakers and transport planners to design interventions that can improve mobility and healthcare access for pregnant women in Nigeria.

# A Cross-Sectional Study of Menstrual Hygiene Practices and Beliefs Among Adolescent Girls at Higher Secondary Level in Selected Schools of Rural, Semi Urban and Urban Regions of Palakkad District, Kerala, India

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Adolescent period is one of the important phases of life which involves a transition from childhood to adulthood. Menstrual hygiene is one of the most important parts of adolescent health yet it is poorly addressed in many parts of the world. Cultural beliefs and practices, inadequate facilities are the reasons for inadequate menstrual hygiene practices among girls. Kerala is one of the most forward societies in India in many aspects. Yet the taboos around menstruation and related practices are still at large. This cross-sectional study examines the menstrual hygiene practices among adolescent girls across rural, semi urban and urban regions of Palakkad district. The aims of the study are as follows: to assess the knowledge and change in menstrual hygiene practices at different regions. To examine the beliefs and taboos related to menstruation. To examine the basic facilities at home and school for maintaining hygiene. Methodology: Primary data was collected by providing a semi structured questionnaire to random students at higher secondary level of a selected school from rural, semi urban and urban regions of Palakkad district. The data were collected on socioeconomic status, awareness of menstrual hygiene, practices and beliefs and facilities at both home and school for maintaining proper hygiene. Secondary data involved maps of Palakkad district from various government sites. Interpretation of both primary and secondary data done and suitable graphs and tables were used to represent detailed analysis. Locational maps were created using open-source software. The study emphasizes the difference in menstrual hygiene awareness and practices among adolescent girls across rural, semi urban and urban regions of Palakkad district. The study stresses on the need for more awareness classes at school level to improve menstrual health knowledge, better hygiene facilities and practices and to reduce social stigma and beliefs related to menstruation. The study also discusses the role of parents, schools, healthcare workers and media in ensuring safe and well-informed menstrual hygiene management for adolescent girls. In conclusion, the study underscores the necessity for proper educational intervention to improve menstrual hygiene knowledge and practices and to address the cultural and social restrictions and dispel beliefs and taboos to promote healthy practices.

**Keywords:** menstrual hygiene, adolescents, rural, semi urban, urban, Palakkad district

# Occupational Health Hazards and Socio-Economic vulnerability among tribal Women Bricks Kiln Workers in Latehar district of Jharkhand (India): A Case Study

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Fire clay bricks are one of the most important buildings materials for the construction of buildings, bridges, homes, offices etc. in country. Brick kiln workers face a range of serious health problems due to harsh working environment, long working hours, continuous exposure if dust, smoke and extreme temperatures. This research paper is an attempt to examine the occupational health hazards socio-economic profile, and nature of works among tribal women brick kiln workers in the study area, to highlight the major problems and challenges faced by brick kiln workers in the study area, to give valuable suggestion for better improvement of working profile and standard of living. Latehar district of Jharkhand has been selected as the study area where several tribal groups are livings. The entire study is based on both primary and secondary sources of data. The study reveals that majority of brick kiln workers are suffered from chronic cough, asthma, musculoskeletal disorders, dehydration, skin burns, sunstroke, eye irritation skin infection, typhoid fever, injuries, skin rashes, malnutrition anemia, gastrointestinal, women's reproductive health problems and mental health problems etc. The result from the study shows that poverty, low literacy levels and unemployment situation is the main reason to taken up this profession. The researchers suggested that there is urgent need to provide vocational training and skill development programmes, like tailoring, needlecraft, poultry farming and dairy farming by various NGO, Ministry of Women's and Child Development to provide supplement their income during off season and medical health camp for awareness about prevention from ill health. Last but not the least there is an urgent need for social concern to frame measures to improve the healthy condition and socio-economic and good working conditions among brick kiln workers for inclusive growth because majority of them are vulnerable and marginalized communities in Indian society.

# Rural-Urban Differentials in Maternal Healthcare Services Utilization in Sub-Saharan Africa

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Maternal health outcomes are poorest in Sub-Saharan Africa. Among others, this has been attributed to the low level of utilisation of maternal healthcare services on the continent. With the urban bias in the provision of healthcare facilities and other public goods using population distribution as a corollary of need, this study hypothesises that the low level of utilisation of maternal healthcare services on the continent stems from a locational mismatch in provision and utilisation of healthcare services. The study adopted a cross-sectional study design using data on place of delivery, place of residence, and other sociodemographic variables in the latest demographic and health survey reports in Kenya, Namibia and Nigeria. The three countries were purposively selected as the study locations to reflect the geographical variation of the African continent and for their varying levels of urbanisation. The population of study comprised women aged 15-49 in the three countries while eligibility was defined by parity among the population of study. In total, 82,918 parous women aged 15-49 were included in the study. Data analysis was at univariate, bivariate and multivariate levels, using binary logistic regression models. More rural women (54.1%) in Kenya utilised health facilities for delivery while in Namibia and Nigeria, the proportions were almost evenly split between urban and rural areas. Relative to rural women, urban women in Kenya (OR: 0.269, $P < 0.05$), Namibia (OR: 0.212, $P < 0.05$) and Nigeria (OR: 0.268, $P < 0.05$) had lower odds of using health facilities for delivery (OR: 0.212 – 0.268, $P < 0.05$). The odds remained negative when other sociodemographic confounders were accounted for. To achieve the double targets of achieving equitable health coverage and lowering the prevalence of poor maternal health outcomes on the continent, prioritizing rural healthcare, as an important component of the health system, is important.

# Session 1

## Parallel Session 4: Climate Change and Health

### Assessment of Microclimatic and Ecological Conditions and Their Influence within The Kabba Development Corridor

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This study investigates the potential socio-economic impacts of microclimatic changes on human health, energy demand, and agricultural productivity within the rapidly developing corridor of Kabba, Kogi State, Nigeria. The research is anchored on the premise that subtle variations in local microclimatic parameters such as temperature, relative humidity, solar radiation, and wind speed can generate profound effects on human wellbeing, economic productivity, and food security. Using a mixed-method design that combines twenty years of meteorological observations (2004–2024), remote-sensing data (Landsat and ERA5-Land), and household-level socio-economic surveys, the study assesses spatial and temporal relationships between environmental change and socio-economic outcomes. Results reveal that mean air temperature in the Kabba corridor has increased by approximately 0.03 °C per year, accompanied by a marked decline in vegetation cover and rise in built-up surfaces. These changes have amplified the local heat island effect and increased outdoor heat exposure among residents. Field interviews and health records indicate a growing incidence of heat-related illnesses, dehydration, and vector-borne diseases, particularly among the elderly, children, and outdoor workers. Thermal discomfort indices suggest that up to 65 % of mid-day outdoor conditions now fall within the “strong stress” category, posing significant risks to occupational health and community wellbeing. The study also finds a clear relationship between rising temperatures and energy consumption patterns. Seasonal demand for electricity and fuel used in cooling appliances has increased by an estimated 22 % over the last decade, thereby raising household expenditure and placing further strain on the already unstable local energy infrastructure. The agricultural sector is equally affected: erratic rainfall distribution, prolonged dry spells, and higher evapotranspiration rates have shortened planting windows, reduced crop yields, and undermined food security. Smallholder farmers reported losses averaging 18–25 % in maize and cassava outputs during the most thermally extreme years. Overall, the findings highlight the intricate linkages between microclimate dynamics and socio-economic vulnerability. The study concludes that sustained microclimatic monitoring, improved urban greening, climate-smart agricultural practices, and public-health awareness programmes are essential to build resilience against climate-induced stressors in Kabba. It further recommends that local policy frameworks integrate microclimate considerations into urban planning and community development strategies. By providing empirical evidence of how small-scale environmental variations cascade into health, energy, and agricultural challenges, this research contributes to broader discourses on climate resilience and sustainable development in emerging Nigerian towns.

**Keywords:** Microclimate; Thermal comfort; Energy demand; Agricultural productivity.Kabba.

## Cartographic insights present in international heat-health plans (2021-2025)

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This work emerged from a bachelor thesis linked to a research project about heatwave impacts on human health. Climate change is making heat waves happen more often and last longer. Heat waves are among the most dangerous climate-related events and can worsen heart problems, breathing problems, and mental health issues. The impact is worse in vulnerable urban areas, where there are intense urban heat islands, high population density, and limited access to protection measures such as cooling spaces and health services. In this context, the aim of the study is to understand how maps are used in heat–health warning systems and how these maps help to communicate risk and guide actions to protect the population. The study analyzed 43 official heat alert plans and response protocols published between 2021 and August 2025. These documents operate at different levels (city, regional, state, national) and were collected from the Global Heat Health Network (WHO/WMO/NOAA). For each plan, the following information was recorded: country, scale of implementation, planned communication channels, and the number of maps included. The data were organized in a spreadsheet, grouped and counted, and then used to generate charts (Google Sheets) and spatial distribution maps (ArcGIS Pro 3.3).
Results indicate rapid growth in these plans after 2021, with a strong peak in 2024. Most of the documents come from Asia (46.5%), followed by the Americas and Europe. The use of cartography is very heterogeneous. Some local plans in Canada and Australia do not include any maps, while other plans rely heavily on maps. Examples include the national plan of Spain (19 maps), the state plan of Karnataka, India (19 maps), and Telangana, India (15 maps), the local plan of Rajkot City, India (15 maps) and the New York State plan in the United States (8 maps).
These maps are mainly used to show high heat-risk areas, locations where people can cool down, health service networks, and priority groups that need targeted support. The main contribution of the study is to present cartography not only as illustration, but as part of the alert system itself. Maps are shown as an operational tool that links climate monitoring, socio-spatial vulnerability, and public health response.

**Keywords:** cartography, climate change, extreme heat, heat-health plans, health geography

# Healing Traditions and Climate Change: A Systematic Review of Tibetan Medicine in Monpa Community

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Tibetan medicine (Sowa Rigpa) has long been a cornerstone of cultural life, healing practices, and ecological engagement among the Monpa community of Tawang in Arunachal Pradesh. Rooted in Buddhist cosmology and intimately linked to Himalayan landscapes, Tibetan medicine serves not only as a therapeutic system but also as a cultural framework that shapes Monpa culture, and relationships with the environment. In recent years, however, rapid environmental transformations driven by climate change, biodiversity loss, and shifting land-use patterns have begun to disrupt the ecological foundations. The study therefore seeks to examine how Tibetan medicine functions within Monpa cultural life, how it is shaped by Himalayan ecological conditions, and how ongoing environmental change is altering its practice, resource base, and intergenerational transmission.

Using the PRISMA 2020 framework, this study conducted a Systematic Literature Review (SLR) of peer-reviewed and institutional sources published between 2000 and 2025. Database searches were conducted across Google Scholar, Scopus, JSTOR, Taylor and Francis using keywords Tibetan medicine, Sowa Rigpa, Traditional Ecological Knowledge, Monpa culture, Monpa community, Tawang, Arunachal Pradesh, Ecology, Environment, and Climate Change. The initial searches identified were collected and duplication was removed. Following full-text assessment, a relevant set of studies was included for synthesis.

The findings demonstrate that Tibetan medicine in the Monpa region is deeply embedded in sacred landscapes, such as high-altitude pastures, forested slopes, and mountain springs that are believed to hold spiritual and medicinal potency. Local healers (amchis), monks, and elder practitioners rely on seasonal indicators, and ecological knowledge to identify, harvest, and prepare medicinal plants. The traditional ecological knowledge (TEK) forms a central part shaping community relationships with land, ritual practice, and concepts of well-being. Yet, environmental change is increasingly destabilizing these systems as many medicinal species are becoming harder to locate due to temperature rise and climate change. The impact of climate change is compounded by the erosion of knowledge transmission, as younger community members migrate for education and employment, reducing participation in traditional harvesting and healing practices. There is absence of integrated studies connecting Tibetan medicine (Sowa Rigpa), Monpa culture, and climate change. Overall, the study underscores that Tibetan medicine is not merely a healing system but an integrated cultural–ecological heritage of the Eastern Himalayas. Its future depends on policies and conservation strategies that recognize the interdependence of culture, biodiversity, and climate resilience.

**Keywords:** Tibetan Medicine, Monpa Community, Systematic Review, Traditional Ecological Knowledge, Climate Change

# Session 2

## Parallel Session 1: Environment and Health

### Intersecting Inequalities: Socio-economic Determinants and Health Vulnerabilities among Tribal Communities in Jharkhand- A Micro-level Analysis of Mahuadanr

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This study presents a micro-level analysis of the intersecting inequalities that shape the socio-economic determinants and health vulnerabilities of tribal communities in the remote and ecologically rich landscape of Mahuadanr, Latehar, Jharkhand. Employing a mixed-methods approach, the research wove together quantitative data from household surveys and government reports with qualitative narratives from focus group discussions and interviews with community members, local leaders, and health workers. The findings reveal a profound cycle of disadvantage, where structural barriers and health challenges are deeply intertwined. Despite strong social cohesion and rich cultural heritage, these communities face persistent economic marginalization, constrained by a reliance on subsistence agriculture, inadequate market linkages, and underdeveloped infrastructure. These conditions translate directly into critical health vulnerabilities, with elevated rates of maternal and child mortality and a high prevalence of preventable diseases such as typhoid and malaria. A central insight from the study is the stark implementation gap that perpetuates this cycle. Despite the existence of government welfare programs, geographical isolation and systemic hurdles consistently impede effective service delivery, leaving remote communities without essential support. The research concludes that breaking this cycle requires a fundamental shift toward integrated, multi-sectoral interventions and advocate for targeted policies that are both culturally sensitive and community-centered, designed to simultaneously promote sustainable economic empowerment, enhance access to education and healthcare, and actively engage tribal populations in shaping their own development. Such an approach is essential to foster inclusive and sustainable well-being while preserving the cultural integrity of Jharkhand's tribal communities.

**Keywords:** Tribal Communities, Socio-economic Determinants, Health Vulnerabilities, Implementation Gap, Sustainable Well-being.

## Health Seeking Behaviour among the Tribal Communities along South Kashmir: A Socio-Cultural and Geographical Perspective

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A complex interplay of socio-cultural beliefs, traditional practices, and geographical accessibility shapes health-seeking behaviour among tribal communities. The present study assesses the health-seeking behaviour among tribal communities along the South Kashmir, focusing on the prevalence of diseases, perception of illness, and utilization of medical systems. Data were collected through field surveys and interviews from selected tribal households. The findings reveal that the overall health-seeking behaviour of the tribal population is not satisfactory. The findings reveal that respiratory diseases (47.5%) are the most common ailments, mainly caused by the use of wood and cow dung for cooking and smoking. Most participants rely on traditional wisdom for understanding disease causation and prevention, while open defecation (67.5%) remains widely practiced. Although healthcare centres are available (82.5%), the utilization of modern health facilities is limited, with a preference for homeopathy and traditional medicine. The results indicate that socio-cultural beliefs and environmental conditions strongly influence health-seeking behaviour, underscoring the need for culturally appropriate health education, improved sanitation, and better utilization of healthcare among tribal populations.

## Health Care After a Disaster: The Case of The 2016 Earthquake in Central Italy

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According to the World Health Organization (WHO, 2005), health is a state of complete physical, mental, and social well-being, a definition later adopted by the Italian Constitution.
This statement gains even more relevance when the consequences of disasters, such as earthquakes, are analysed. These events not only compromise physical health but they can also deeply affect mental balance (Bertinelli et al., 2023), weakening the social capital (Aldrich, 2012) and the community's capacity for proactive response.
The earthquake (Mw 6.61) which hit Central Italy in 2016 represents a paradigmatic example. The event, in fact, affected territories already marked by existing structural, demographic, and healthcare vulnerabilities, impacting the population's overall health (Grappasonni et al., 2019).
The disruption of health-care infrastructure and the consequential interruption of basic services have made access to care more difficult, especially for the most vulnerable.
The psychological impact has generated a significant increase in post-traumatic stress disorder (PTSD) cases and addictions, often exacerbated by precarious housing and a lack of stable support. Socially, youth depopulation and the consequential ageing of the population

(Bartolini & Fatichenti, 2025) have weakened social capital and increased exposure to vulnerability within the community.
This study analyses the multidimensional impact of the 2016 Central Italy earthquake on the affected population, adopting an integrated perspective that examines the interplay among environmental, health, and governance-related factors.
A mixed methods approach was applied, combining quantitative analysis of demographic and health indicators, and qualitative research on good community care practices developed during the post-disaster phase.
Findings contribute to the international debate on how to integrate the One Health paradigm, focused on the interactions between human, animal, and environmental health, into post-earthquake reconstruction policies.
Results highlight the need to integrate top-down governance with bottom-up community initiatives to promote inclusive territorial policies and enhance the resilience of Italian Apennine communities.

## Hypertension and Environmental Risk Analysis in Makurdi Metropolis

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The study investigated hypertension and environmental risk analysis in Makurdi metropolis. The objectives were to analyze the temporal trend of hypertension between 2014 and 2023, assess its spatial pattern and prevalence across the study area, and identify and explain the major risk factors influencing its occurrence. Five hospitals were purposively selected for the study Federal Medical Centre (FMC), General Hospital North-Bank, Ushaka Hospital, Bishop Murray Hospital, and Madonna Hospital because all are situated within Makurdi town and collectively represent the key healthcare facilities serving its population. Secondary data were collected from each respective admission register with help medical personnel across the hospitals. Data were subjected to analysis of variance (ANOVA) using SPSS 16.5. Findings from the temporal trend analysis revealed that the highest number of hypertension cases occurred at the Federal Medical Centre in 2015 with 181 cases, indicating a peak in disease occurrence during that year. Spatial analysis showed that hypertension cases were highly clustered, with a nearest neighbor ratio of 0.2757, a z-score of -31.07, and a p-value of 0.000000, confirming statistically significant clustering. The densest concentrations of cases were observed around Wadata, Clerk Market, Ankpa, and North Bank wards. Among the identified risk factors, the age group 60–64 years recorded the highest prevalence (62.66% males and 37.34% females), while dependents such as retirees and unemployed individuals accounted for the highest number of cases (1,174 cases), indicating that aging and low socio-economic status are the most influential determinants of hypertension in Makurdi. In conclusion, hypertension in Makurdi town is temporally variable, spatially clustered in urbanized wards, and strongly associated with age, gender, and occupation. In terms of recommendation, public health interventions should prioritize elderly and economically dependent populations, particularly in high-density urban areas. Efforts should focus on sustained community health education,

affordable medical care, and lifestyle modification programs aimed at controlling blood pressure and reducing environmental and socio-economic risk factors.

**Keywords:** Hypertension, Environmental Risk Factors, Spatial Analysis, Temporal Trend, Makurdi Metropolis, Socio-economic Determinants.

# Session 2

## Parallel Session 2: Infectious Diseases and Health Geography

### Where Did the Pandemic Arrive First? Spatial Diffusion Analysis of COVID-19 in Brazil

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The COVID-19 pandemic has caused severe global impacts, but the spatial dynamics of its spread, especially in a country as large and diverse as Brazil, remains of vital importance for public health planning. This study addressed this research gap by analyzing the spatial spread of confirmed COVID-19 cases and deaths in Brazil's 5,570 municipalities over the entire historical period of the pandemic, from the first confirmed case in Brazil on February 26, 2020 to May 5, 2023 – 1,165 days. Data analysis, which involved processing a massive volume of 6,693,097 records organized daily for the 5,570 municipalities, was carried out using Python (version 3.10) in the Google Colab environment. Spatial visualization (mapping) was carried out in ArcGIS Pro (version 3.5.4). Using official data from the Brazilian Ministry of Health, combined with the urban hierarchy and population classification of Brazilian municipalities, the research employed spatial analysis methods to corroborate the hypothesis of hierarchical spatial diffusion. The results strongly supported this hypothesis: municipalities with smaller populations and lower levels of urban hierarchy registered their first confirmed cases and deaths significantly later. This relationship showed a moderate association, with a coefficient of determination (R2) of 0.395 for cases and 0.336 for deaths. The box plots graphically illustrate this hierarchical pattern, revealing a clear time lag in the 11 urban hierarchy categories: the earliest median dates for both first cases and first deaths were found in the Great National Metropolis and the Metropolises, which are the populous, connected and densely urbanized municipalities. Nonetheless, the latest median dates for first cases and first deaths were observed in the Central Place, the lowest level, which covers 72% of Brazilian municipalities. Furthermore, analysis of the time interval (in days) between the first case and the first death revealed that the median interval increased as the urban hierarchy decreased. While the large metropolitan areas had short median intervals (between 1 and 10 days), the Central Place had the longest median interval (approximately 75 days) and the highest number of outliers, indicating a significant delay in the first death in relation to the first case in these smaller and more remote localities, with less expressive health systems. The study concludes that the spread of COVID-19 in Brazil followed at least three distinct rhythms: hierarchical spread (in the metropolises), cascading spread (in regional capitals) and delayed spread by contagion (in central places). Identifying this model based on geographic information is fundamental for strengthening health policies within the Brazilian Unified Health System (SUS).

**Keywords:** Health Geography, Pandemic, Spatial Diffusion, Spatial Analysis, Urban Hierarchy

# Spatio-Temporal Dynamics of COVID-19 Vulnerability Among Elderly Populations: A Neighborhood-Level Analysis in Curitiba, Brazil

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This study examined the effect of socio-environmental vulnerability on COVID-19 outcomes among the elderly (≥ 60 years) during the Public Health Emergency of National Concern (PHENC) period in Curitiba, Paraná, Brazil. Using 2010 Census data aggregated to 75 neighborhood and municipal COVID-19 records, we employed non-parametric correlations, robust multiple regressions (HC3 errors), structural change point detection, and spatial-temporal analysis (Moran's I, LISA, Bivariate LISA). Results: Mean incidence was 144.2/1000 elderly (SD=33.2), hospitalization 32.3/1000 (SD=9.4), and mortality 13.6/1000 (SD=4.6). Most variables exhibited non-normal distributions (Shapiro-Wilk p <0.05). Hospitalizations showed the strongest ecological associations (Spearman's p) with vulnerability indicators: low income (p = 0.444, p <0.001), illiteracy (p = 0.429, p <0.001), and household overcrowding (p = 0.399, p <0.001). Similar patterns emerged for mortality and incidence. After stepwise selection and correction for heteroscedasticity, the hospitalization model had the highest explanatory power (Adj. R2 = 0.317), followed by mortality (Adj. R2 = 0.150) and incidence (Adj. R2 = 0.148). Low income was the most consistent predictor across all three outcomes (e.g., hospitalization: β = 0.44, p <0.001). Moderate multicollinearity (max. VIF = 7.3) was noted between low income and illiteracy. Change point detection identified eight statistically distinct periods in the weekly hospitalization time series, revealing the dynamic nature of vulnerability's impact. The effect of low income peaked during high transmission (Period 4: β = 0.009, p <0.001) but became non-significant during low transmission phases (Period 6: p = 0.435), confirmed by Chow tests (p <0.05 for most indicators). Segmented regression significantly improved model fit (Adj. R2 from 8.3% to 76.9%), emphasizing the importance of temporal context. Global Moran's I detected significant positive spatial autocorrelation for incidence (I = 0.207, p <0.001), hospitalization (I = 0.315, p <0,001), mortality (I = 0.166, p = 0.004), and most vulnerability indicators. Univariate LISA maps identified consistent High- High clusters (high risk/outcome surrounded by high values) in peripheral southern neighborhoods (Campo de Santana, Umbará). Bivariate LISA revealed the spatial-temporal dynamics of inequality: the spatial co-location of high-hospitalization with high neighborhood vulnerability (low income, overcrowding) and low geographic access indicators (low facility density – High-Low outliers) was most pronounced during critical pandemic periods (1-5), particularly in these peripheral areas. Findings highlight significant spatial-temporal health inequalities in COVID-19 outcomes among the elderly, strongly linked to neighborhood socio-environmental context. Understanding these dynamic geographic patterns is crucial for equitable public health planning and intervention targeting.

# Estimating Malaria Fever Risk in West Bengal, India using Space-Time Conditional Autoregressive Model

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Malaria, a prominent VBD causing over a million annual deaths worldwide, predominantly affects vulnerable populations in the least developed regions. Despite the increase in malaria control and elimination efforts, climatic and non-climatic factors continue to serve as important drivers of malaria transmission which is highly variable in space and time. A vital aspect of disease management lies with identifying associated risk factors in space and time.
As the country is moving towards malaria free nation, utilizing space time conditional autoregressive modelling, this study examined decadal surveillance data to uncover spatio-temporal heterogeneity and long-term effects of conventional climatic and non-climatic factors factors in Plasmodium vivax and Plasmodium falciparum transmission and health inequalities within blocks in the state of West Bengal. Different space time conditional autoregression (STCAR) models were developed to quantify how P. vivax and P. falciparummalaria fever risk were influenced by lag and without lag effected climatic and associated non-climatic factors. Statistical inference was performed in a Bayesian setting using Markov chain Monte carlo (MCMC) simulation.
The results indicate that the spatio-temporal heterogeneity of P. vivax and P. falciparum risk at the block level are significantly increased by climatic and environmental variability, coupled with socio-demographic attributes particularly in high-risk blocks. With incorporation of lag effect, temperature, rainfall, and relative humidity, along with environmental variables remain influential in modulating malaria risk across both species. In terms of spatial influences, higher education and income levels serve as effective predictors of reduced malaria risk. Conversely, dense population, employment in specific occupations, scheduled tribe households, as well as marital status and disability correlate with an increased risk of malaria infection. The spatio-temporal risk mapping revealed movement of high risk blocks from established locations to newer areas, particularly towards the fertile yet vulnerable lower Gangetic plain. Whereas the trend of health inequalities is decreasing narrowly over time which signifies the region is still experiencing a greater burden of malaria.
The space time models are capable of investigating geographical heterogeneity for both malaria species, emphasizing the need for tailored approaches. Addressing the determinants of malaria transmission as well as estimating health inequalities necessitates regional collaboration and strategic plans, which are critical steps towards overcoming the remaining hurdles in malaria eradication and enhancing both community health and well-being in affected regions.

**Keywords:** Malaria, Heterogeneity, STCAR, Health Inequality, West Bengal

# Prevalence and Analysis of Fluorosis: A case study of West Bengal

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West Bengal, is one of the largest states of India, both by population (4th) and area (13th). Being such a large state, it has one of the highest incidences of Fluorosis. This effect is especially severe in western district of West Bengal such as Bankura, Purulia and Birbhum. Largely due to excess Fluoride in ground water. In this research we would like to show the current Fluorosis levels and compare with historical evidences for the states. Steps to minimize the subsequent effects will be tried to be described here.
Fluorosis takes a huge toll on human health and ecosystem. Accumulation of Fluoride in the food chain leads to potentially devastating impacts, creating economic loss and even potential irreversible effects on our natural surroundings. Thus, it is necessary to address this issue. For this case we have chosen West Bengal as a subject.

**Keywords:** Fluorosis, Human Health, Environment, Groundwater, West Bengal.

# Session 2

## *Parallel Session 3: Migration and Health*

### Emerging Trends of Internal Migration and Associated Health Challenges in Sub-Saharan Countries: Nigeria in Perspective

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Away from the traditional patterns of migration, this chapter examines the recent trend and pattern of internal migration in Nigeria. While earlier studies have established the common internal migration as flows from rural to urban, urban to rural, and urban to urban areas. Recent processes of extreme weather events and internal conflict have accentuated the flows of internal migration and increased the number of internally displaced persons (IDPs) in Nigeria. Drawing inspiration from the theory of Push and Pull factors of internal migration, this present study examines the recent pattern, determinants and the related health challenges of internal migration in Nigeria. The study focuses on the factors that contribute to internal migration, such as variation in resource endowments and economic advantages, political instability, and social tensions. Additionally, it considers the various impacts of internal migration on both the migrants and the host communities. The study relies mainly on secondary data and explores potential solutions to address the challenges associated with internal migration in Nigeria, such as promoting peace-building initiatives as well as implementing sustainable development programs. The findings show that the population of Nigeria has increased over the years from 44.92 million in 1960 to over 213.40 million in 2021 and the demand for resources by the growing population may have influenced migration patterns within Nigeria. Apart from the pattern of migration with people first moving from rural areas to smaller towns and then to larger cities, conflict and disasters triggered new and repeated displacement in Nigeria in 2024, bringing the Internally displaced persons to 3.7 million which is among the highest figures in sub-Saharan Africa. Overall, the chapter provides a comprehensive understanding of the recent complexities of internal migration as well as its attenuating effects in Nigeria and offers recommendations for addressing this pressing issue.

**Keywords:** Internal, Migration, Conflict-induced, Extreme Weather, Factors

# Determinants of Health Outcomes among Rural-to-Urban Student Migrants: A Quantitative Analysis

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Rural-to-urban migration for higher education has become a defining socio-economic process in developing regions, significantly influencing the health and well-being of students. This study investigates the relationship between migration, lifestyle adaptation, and health outcomes among rural-origin students studying in urban areas, especially in Kolkata. Primary data were collected from 128 respondents through a structured questionnaire. The dataset covered socio-demographic attributes, migration characteristics, lifestyle behaviour, and self-assessed health conditions. Analytical techniques included descriptive statistics, Chi-square tests, and binary logistic regression to explore associations and determinants of health problems.

The Chi-square analysis revealed significant associations between the type of accommodation and health issues ($x^2 = 6.64$, $p = 0.035$), duration of stay and health problems ($x^2 = 8.21$, $p = 0.017$), and physical activity and overall health status ($x^2 = 10.47$, $p = 0.005$). The binary logistic regression model indicated that students residing in rented rooms were 2.1 times more likely to experience health problems than those in hostels, while those who exercised regularly were 64% less likely to report adverse health outcomes ($exp = 0.36$, $p < 0.05$). Duration of stay exceeding three years increased the odds of health issues by 1.8 times.

The findings highlight that lifestyle changes after migration, inferior accommodation and irregular physical activity adversely affect student health. From a policy perspective, interventions such as improved hostel facilities, campus-based health checkups, and awareness campaigns promoting balanced diets and exercise are essential to safeguard migrant students' well-being.

**Keywords:** Migration, Urban area, Student Health, Rural-to-Urban, Chi-square, Logistic Regression, Lifestyle.

# Session 2

## *Parallel Session 4: Health Geography*

### Spatial analysis of acute respiratory infection associated with indoor air pollution and socio-economic condition: case of Punjab Pakistan

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Acute respiratory infection is a leading cause of illness and death among children under 5 years of age in Punjab. This study provides a spatial analysis of acute respiratory infection in children under five years in Punjab Pakistan. This study uses Multiple Indicator Cluster Survey (MICS) and District Health Information System (DHIS) data to investigate the spatial distribution and socio-economic factors influencing the prevalence of ARI. The study utilized Geographic Information System (GIS) techniques and Ordinary Least Square (OLS) regression models to analyze the relationship between ARI rates and socio-economic variables including poverty, illiteracy women, tobacco use, indoor air pollution and malnutrition. The study reveals that tobacco women, poverty, housing characteristics and cooking fuel type are the most significant predictors of ARI incidence. The major predictors of ARI include tobacco women (P=0.00003) poverty (P=0.001) poor housing condition (P=0.002) and type of cooking fuel with an adjusted R- squared value of (0.62). In contrast factors such as household size (P=0.181) vitamin A supplementation (P=0.247) and room density (P=0.460) were found to be non-significant with weaker associations to ARI. Urban centers like Lahore and Faisalabad experience higher incidence of ARI due to air pollution. While Southern Punjab faces increasing cases due to high poverty and reliance on solid fuels for cooking leading to indoor air pollution. The study reveals disparities in ARI rates across Punjab with Hafizabad (32.89% per 1000 population) and Sheikhupura (35 per 1000 population) reporting the highest incidence while Mianwali and Attock in Western Punjab also show consistently high cases. Socio economic deprivation plays a significant role with high poverty rates (6.2%-65.8%) and women illiteracy (36.4%) strongly linked to ARI prevalence. More than 90% of households in Southern Punjab use solid fuel further exacerbating the quality of the atmosphere. Poverty and non-literacy indicate a strong correlation (R=0.86) but the use of tobacco has a lower link with ARI symptoms (R=0.19). The study findings highlight the urgent need to improve access to health care vaccination programs and maternal education to mitigate the impact of ARI in Punjab.

**Keywords:** Acute respiratory infection, Spatial analysis, Indoor air pollution, Socio economic determinants

# Health Infrastructure Disparities in Jharkhand: An Inter-District Analysis for achieving SDG 3 by 2030

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The Sustainable Development Goals (SDG) are directly and indirectly related to health. SDG includes 17 targets and only SDG-3 talk about health, but all other 16 targets talk about socio-economic development of people which is related to health. An economically prosperous nation is backed by health people of the nation and "backbone" of a healthy nation is its health infrastructure. Given its significance, this study investigates the disparities in health infrastructure across the districts of Jharkhand, using a Health Infrastructure Index (HII) using Principal Component Analysis (PCA) to evaluate and rank districts based on their healthcare facilities and resources. The study is based on secondary data sourced from Rural Health Statistics 2021-22. The analysis of HII shows Simdega is best performing district and Dhanbad is worst performing district in the state. Further, Dhanbad has a high number of health infrastructure than Simdega but per 10000 availability of health infrastructure is higher in Simdega than Dhanbad. Because Dhanbad is an industrial hub hence population density is highest and Simdega is a forested and backward district of Jharkhand hence population density is lowest among the districts of Jharkhand. Based on HII, the districts are categorised into three category such as "developed", "backward" and "highly backward". About 50 percent of districts come under the "backward" category.

**Keywords:** Sustainable Development Goals (SDG), Health infrastructure, Principal Component Analysis, Health Infrastructure Index, Inter-district disparities and Secondary data.

# Determinants of Contraceptive Behaviours by Residence in South-Eastern Nigeria: A Descriptive Approach

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A healthy lifestyle is everybody's dream, and one way to achieve this is Planned Parenthood. The use of contraceptives is not only integral to healthy living but valuable for the fulfilment of the Sustainable Development Goals on health and gender equality. Despite this importance, there is a paucity of evidence in understanding contraceptive knowledge and behavior in low-resource settings such as Nigeria. To this end, this study investigated contraceptive praxeology in contraceptive behaviour. Specifically, this study adopted the knowledge, attitude, and practices survey (KAP) framework to describe how knowledge of contraceptives, attitude towards contraceptives and practices of contraceptives explain contraceptive behavior in Southeastern Nigeria. Using a multistage sampling techniques

comprising purposive, convenience, and systematic sampling technique, a sample of 416 potential participants was selected for this study from a population comprising both females (aged 15 – 49 years) and males (aged 15 – 64 years) in three States from the Southeastern parts of Nigeria. The primary data used for this study were obtained from a well-structured and validated questionnaire personally administered by the researcher and her assistants as a part of a previous broader study. After checking for response completeness and usability, data from a final sample size of 344 respondents were used in this study. The objectives of the study were analyzed using descriptive statistics such as tables, frequencies, percentages, charts, and maps. The findings of this study showed that while knowledge of contraceptives was generally widespread, and attitude towards contraceptive tended to be positive, contraceptive prevalence was generally below average in all the study locations. Furthermore, social media appeared to be the commonest source of information on contraceptives, compared to radio and newspaper. Based on the findings of this study, it was concluded that, high knowledge of, and positive attitudes towards contraceptives may not necessarily translate to practical use of contraceptives, and this may, among other reasons, be attributed to misinformation from social media platforms which appears to be the commonest source of contraceptive information. It was recommended that prevalence might be enhanced by mounting evidence-based re-education programmes beyond the so-called facts presented by social media platforms.

**Keywords:** Healthy Lifestyle, Sustainable Development Goals, Contraception, Knowledge, Attitude and Practices Survey (KAP), Population.

## Geo-Spatial Evaluation of Child Malnutrition In Jigawa State

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Child malnutrition is a critical global public health problems. Increasingly, the conditions of child malnutrition coexist in nations, communities and households. Spatial distribution is examined because of uniqueness of places. Each place has its unique characteristics and circumstances that may influence conditions and disease. Mapping and statistical analyses were employed in determining the outpatient distribution from 2010-2020 within various localities. The analyses results reveals that the localities with highest reported cases of >100 were Jarmai (Babura), Kanya (Babura), Dandi (Kazaure), Diginsa(Birniwa), Bosuwa (Maigatari), and Maigatari (Maigatari). Followed by Bamaina (Birnin Kudu), Kangire (Birnin Kudu), Aujara (Jahun), Jahun Urban Maternity (Jahun), Musari (Guri) and Guri (Guri) with 81-100. In addition, about 200 localities have reported less ten (10) cases. Considering the senatorial districts, the study further revealed that, Jigawa West Senatorial District has higher reported cases than Jigawa Central and Jigawa East Senatorial District. This might be connected to the fact that, out of Sixty Seven (67) outpatient centres in the state, Jigawa West Senatorial District has 31 centres.

# Session 3

## *Parallel Session 1: Planetary Health*

### Urbanisation and Ecosystem Resilience: A Three-Decade Assessment of Delhi's Blue–Green Spaces (1991–2023)

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Delhi, one of the fastest-urbanising megacities in the Global South, has experienced significant ecological decline over the past three decades due to rapid land-use change and fragmentation of blue-green space (BGS). This study assesses ecosystem health evolution This study assesses ecosystem health evolution from 1991 to 2023 using a geospatially integrated Vigor–Organisation–Resilience–Recoverability (VORR) framework. Multi-temporal Landsat imagery, landscape metrics, and resilience diagnostics were combined to derive a composite Ecosystem Health Index (EHI), validated through bird diversity data. The results show the degraded ecosystems expanded by 50.8%, with "Poor" zones increasing from 541.47 km² to 816.36 km² between 1991 and 2023, accompanied by a >50% decline in Persistence Surfaces (PS) and reductions in ecological vigor, structural integrity, and resilience. The city's heterogeneous decline highlights the need for integrated blue-green infrastructure (BGI) networks and community-led restoration frameworks that enhance connectivity, protect biodiversity, and promote socio-ecological equity. These strategies are essential for rebuilding ecosystem functionality and urban sustainability under climatic and developmental pressures. This study assesses ecosystem health evolution from 1991 to 2023 using a geospatially integrated Vigor–Organisation–Resilience–Recoverability (VORR) framework.

**Keywords:** Urbanisation, Blue–Green Spaces (BGS), Ecosystem Health Index (EHI), Environmental Health, Delhi

### Assessing Ecosystem Health and Landscape Dynamics of the East Kolkata Wetlands, India

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The East Kolkata Wetlands (EKW) in Kolkata, India, span 12,500 ha and are a vital ecological zone providing several benefits, including water purification, flood control, and biodiversity support. This study investigated land use and land cover (LULC) alterations in the EKW from

1991 to 2023, using a random forest (RF) machine learning model. Significant LULC changes were observed over the 32 years, with wetland areas decreasing from 91.2 km² in 1991 to 33.4 km² in 2023, reflecting substantial habitat loss and reduced ecosystem services. Conversely, agricultural land expanded from 27.8 km² to 58.7 km² needs, and built-up areas increased dramatically from 0.2 km², driven by economic and food production to 10.5 km², indicating rapid urbanization. This study evaluated the health, resilience, and ecosystem functionality of EKW by analysing human-induced land use changes and using ecological indicators and landscape metrics. Landscape and class level metrics such as PLAND, largest patch index (LPI), total edge (TE), edge density (ED), number of patches (NP), and patch density (PD) were used to analyse the spatiotemporal dynamics of the wetlands. This study revealed a significant increase in fragmentation, with the number of patches increasing from 2689 in 1991 to 4532 in 2023, despite a consistent decrease in core wetland areas. Ecosystem health indicators, such as the ecosystem structure index (ESI) and landscape deviation degree (LDD), were used to assess landscape metrics and fragmentation changes. The ESI and other metrics revealed significant temporal fluctuations, providing insights into landscape structure, connectivity, and heterogeneity. The ESI improved from 0.87 in 1991 to 1.03 in 2023, indicating enhanced connectivity and diversity. Conversely, the LDD increased from 20.6% to 56.85%, indicating a shift towards impervious surfaces. The vegetation productivity and ecosystem health index (EHI) decreased, indicating biodiversity loss and reduced carbon sequestration. The EHI also dropped from 0.67 to 0.55, signifying ongoing environmental stress. This study emphasizes the need for conservation efforts to maintain the ecological integrity of the EKW amidst urbanization and land use changes and recommends a balanced approach for sustainable urban development and enhanced wetland resilience.

**Keywords:** East Kolkata Wetlands, Wetlands, Fragmentation, Ecosystem health index, Land use/land cover, Ecological resilience

## Invisible Threats of Air Pollution and Respiratory Health in Kolkata's Urban Landscape

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Air pollution is the presence of harmful substances in the air which can even cause death to some extent. This article evaluates the current status of air pollution in urban areas specifically in Kolkata and explores its impacts on respiratory health. The urgent need for effective air quality management and policy interventions is focused here to secure public health. Air pollution in urban areas significantly affects older adults, children and pregnant women. Industrial emissions release pollutants that damage vital organs by entering the circulatory and respiratory systems leading to chronic diseases.

After going through many case studies, it is found that polluted air is considered to have killed more than 6.7 million people worldwide and for India about 7.2% of all deaths are responsible for exposure to small and hazardous particulate matter. The health impacts of poor-quality air are serious and needs urgent attention. To fight against this, implementation

of green spaces, afforestation and sustainable mobility are important and have shown beneficial impacts. Government initiatives and policies will contribute to the solution of this worldwide problem. Kolkata ranks among the top 10 most polluted cities in the world. .. The vulnerable group of people include children, older adults, slum dwellers, low-income families (who are often ignored) and those with pre-existing respiratory and cardiac symptoms. Interviews were conducted with people living in Newtown, located on the north-eastern periphery of Kolkata. Residents complained about the prevalence of high-rise buildings and the lack of greenery. Most people were observed wearing masks while at work. Interestingly, some of those who voiced concerns about air pollution still burn firecrackers during festival. Pollutants like PM2.5 and No2 increases the risk of heart attack. 355 of the population in Kolkata suffer from heart attacks. Close to half young population in Kolkata suffer from asthma. One in every two children in Kolkata suffers from air pollution. Roads are not maintained, pollution control measures are not taken properly and as a result air pollution is increasing and people are suffering. PM2.5 is the most prevalent pollutant in Kolkata which can be inhaled easily , which leads to various health problems, including heart disease and respiratory problems. Burning of coal tar for road construction in open air is a common practice in Kolkata which releases carcinogenic compounds in the air. This study deals with problems people are facing due to air quality and how it can be solved.

## Green Building Practices for Urban Health: Climate-Responsive Design and Energy Efficiency in Densely Populated Cities

***Sai Sharan B[1], Abhishek Rao[2]***

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This study investigates how green building methods address climate change by improving energy conservation and enhancing public health in urban settings. This is to address climate change and related health issues. Buildings are a significant part of global energy use and greenhouse gas (GHG) emissions. In the context of an ongoing climate change threat, sustainable approaches are needed in all aspects of building design and construction. Green building techniques, such as renewable energy, energy efficient lighting, natural ventilation, and environmentally preferred materials, may provide viable approaches to reducing carbon emissions and total energy consumption. This paper aims to emphasize that energy efficient design towards green buildings do not just saves resources but are also advantageous to the health of occupants by improving the indoor environmental air quality, thermal comfort and lighting comfort without energy burning an expensive HVAC system and more. This paper includes data gathered from case studies and research reports to show that certified buildings save between 18-30% energy savings under normal conditions and 80-95% under advanced conditions!

This paper says that the integration of green building practices into mainstream architecture can be a step toward achieving both environmental and health goals. The primary challenge

continues to be high initial costs and limited awareness, but the long-term benefits are better.

Ultimately, we argue that green buildings represent more than just strategy and are actually a holistic approach that supports planetary health! Green building practices can readily reduce the adverse effects of buildings on our environment while also promoting human health. Practices like the use of clean energy (solar and wind), energy-efficient lighting systems, the pursuit of natural ventilation, and other sustainable materials are examples of green building practices. Each of these practices, individually and in conjunction with one another, greatly diminishes reliance on fossil fuels and, therefore, the ability to produce carbon. In addition to the operational efficiency of a green building, its emphasis on passive building strategies that promote natural sunlight and thermal comfort reduces the need for energy-intensive heating, ventilation, and air conditioning (HVAC) systems.

One of the primary goals of this paper is to show how resource-saving and human-health-friendly the energy-efficient design green buildings are. One of the immediate benefits of improved indoor environmental quality (IEQ) for building occupants is better circulation of air, reduced use of toxic materials, and improved natural light. This results in fewer respiratory issues, allergies, stress, and other health-related issues for building occupants. As usual, the focus on improved health benefits of green building practices are that it is particularly useful and relevant for densely-populated urban environments that have struggled with poor air quality for years.

# Session 3

## *Parallel Session 2: Urban Health*

### Spatial Epidemiology of Waterborne Diseases in Delhi

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Delhi, India's capital and one of the fastest-growing megacities, faces a persistent burden of waterborne diseases due to inadequate water, sanitation, and hygiene (WaSH) infrastructure. Bacterial diseases such as cholera, typhoid, and diarrhoea, viral infections including dengue and hepatitis A–E, and protozoal diseases like malaria significantly impact public health. This study aims to examine the spatial and temporal trends of waterborne diseases across Delhi from 2014 to 2021, employing geospatial tools to map disease incidence and assess emerging patterns. Using GIS-based hotspot and overlay analyses, high-risk zones were identified in relation to infrastructural disparities. The findings highlight clusters of disease vulnerability in poorly serviced regions, underscoring the link between inadequate WaSH services and elevated health risks. Based on these results, the study proposes targeted policy recommendations for improving urban health planning, strengthening WaSH infrastructure, and mitigating future outbreaks, thereby reducing health vulnerabilities in Delhi's urban environment.

**Keywords:** Delhi, Hotspots, GIS, epidemiology, health, infectious diseases

### Municipality supplied water quality assessment and Human Health exposure in Borough-II, Asansol Municipality Corporation, India

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A study on the quality of municipality-supplied water and its potential health hazards was conducted in Borough-II (formerly Raniganj municipality) of the Asansol Municipal Corporation (AMC), West Bengal, India. The study assessed the water's suitability for drinking and bathing and evaluated associated health risks through a door-to-door questionnaire survey of 302 respondents. Forty water samples were collected using a systematic grid-point method and analysed in a biochemistry laboratory for pH, salinity, total dissolved solids (TDS), electrical conductivity (EC), and fecal coliform (FC) levels, following standard protocols (BIS, CPCB, WHO, EPA, APHA). Data were analysed using descriptive and inferential statistics,

including covariance and correlation matrices. Water Quality Indices (WQI) for drinking and bathing were calculated, and Health Hazard Indices (HHI) were derived separately for adults and non-adults. Results indicated that most samples met "Good" drinking water standards (76%), with outliers classified as "Poor" due to high TDS or extreme pH. Bathing water quality was predominantly "Excellent" (82.5%), with a few samples showing pH deviations. Statistical analysis revealed strong correlations between TDS, salinity, and EC, while pH was independent. Health hazard quotients (HQ) were low for adults (<0.3) but higher for non-adults, particularly in Wards 33 and 35, suggesting greater child vulnerability. The study concludes that water quality is generally satisfactory, but localized contamination in specific wards (e.g., Ward 35) warrants targeted interventions. Recommendations include enhanced purification in high TDS/salinity areas and long-term monitoring to mitigate health risks, especially for non-adults.

**Keywords:** Raniganj municipality, Systematic grid-point sampling, Water quality indices, Health hazard indices, Health hazard quotients

## Environmental Impacts on Human Health in Dehradun City

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Dehradun, the capital of Uttarakhand, offers a blend of natural beauty and rapid development. Over the past few decades, urbanization, industrialization, and a growing population have increased environmental pressures. This study aims to analyze the impact of environmental factors on human health in Dehradun City. The study considered environmental aspects such as air pollution, water quality, noise pollution, solid waste management, and lack of green space. The main sources of air pollution are transportation and industrial activities, which contribute to an increase in respiratory diseases, allergies, and cardiovascular diseases. Water pollution, primarily from the mixing of wastewater and pesticides, contributes to water-borne diseases such as typhoid, diarrhea, and cholera. Noise pollution, primarily generated by traffic and construction activities, is associated with mental stress, sleep problems, and hearing loss. Inorganized solid waste management contributes to health risks and the proliferation of mosquitoes and other pests in the city. The study also found that the lack of green spaces and increasing heat conditions contribute to mental health problems, fatigue, and reduced quality of life among urban residents. Additionally, climate change, such as increased temperatures and changes in rainfall patterns, can influence the spread of seasonal diseases. This research provides important information for local administrations, health departments, and policymakers. Environmental improvements, such as green space development, pollution control, water purification, and waste management, are essential for protecting human health. The findings suggest that balancing urban development and environmental protection is essential to improve the quality of life for urban residents.

**Keywords:** Dehradun, human health, environmental impacts, air pollution, water quality, urbanization.

# Session 3

## *Parallel Session 3: Gender and Health*

### Listening to the Living, Counting the Dead, and Mapping Absences: Feminist Geographical Reasoning as Disobedience in Brazilian Health Geography

***Carolina Simon***
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I am a Latin American woman geographer and a Brazilian researcher, speaking from the South, where the boundaries between life and death are drawn by geography. In this work, I present what I call Feminist Geographical Reasoning (FGR), an engaged epistemological and methodological proposal that I have been developing in the field of Feminist Health Geography. My thesis is based on the conviction that feminicide is a silent geographical phenomenon, in which space acts as an active category that conditions the fundamental right to life. I thus understand that the right to life is geographically conditioned, and that thinking about women's health requires breaking with the universalism and colonial neutrality of the geographical discipline. The FGR is structured around a methodological triad that, for me, constitutes a militant praxis of epistemological disobedience. The first axis, Listening to the Living, expresses my commitment to situated feminist listening, which recognizes narratives of survival as coordinates for public policy. Listening is not data collection: it is embracing the experiences woven through “dororidade” (pain-sisterhood) and sisterhood, and understanding in them the power of women's re-existence. The second axis, Counting the Dead, reflects my effort in critical quantitative analysis: I map the spatial distribution of feminicide and transfeminicide, treating each death as a sentinel event that denounces the failure of the state and the urgency for public health to recognize the killing of women as a territorial issue. The third axis, Mapping Absences, is an act of cartographic insurgency. Through Critical Feminist Cartography, I expose the inequality in the presence and access to protective resources, especially in Shelter Homes, highlighting “Feminicídio de Estado” (State Feminicide), when territorial omission legitimizes lethality. To support this analysis, I mobilize the concept of Situated Intersectionality, which allows me to understand how gender, race, class, and coloniality intertwine in the production of vulnerability and care. And it is from “Suleamento” (Southing), as a theoretical and political choice, that the FGR assumes its decolonial vocation: to dispute the hegemonic narratives of space and affirm other geographies, which emerge from a radical commitment to women’s lives.

**Keywords:** Feminicide; Intersectionality; Decolonial Feminism; Critical Feminist Cartography; Health Geography

# Perceived Discrimination and Healthcare Avoidance among Women: A Qualitative Exploration—A Case of Kolkata

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Perceived discrimination within healthcare settings constitutes a significant barrier to accessing care, frequently resulting in healthcare avoidance and adverse health outcomes. Although global studies have documented this association, there is a lack of qualitative, in-depth research examining the specific experiences, mechanisms, and consequences among women in metropolitan Indian contexts such as Kolkata. The present study addresses this gap by investigating how women in Kolkata perceive and experience discrimination in the healthcare system and how these experiences influence their decisions to seek or avoid necessary medical care. A qualitative research design was implemented using in-depth semi-structured interviews (IDIs). Women from diverse socio-economic backgrounds in Kolkata, who reported previous experiences of discrimination in healthcare settings, were purposively sampled. The interviews examined the specific nature of discrimination, including factors such as gender, class, caste, appearance, or health condition, as well as the emotional and psychological effects and subsequent behavioral responses, particularly decisions to delay, forgo, or avoid healthcare services. Thematic Analysis was employed to identify recurring patterns, core themes, and explanatory models that elucidate the relationship between perceived discrimination and healthcare avoidance. The analysis identified core themes illustrating the lived experience of discrimination and avoidance. Key findings revealed that discrimination often manifested as disrespectful communication, judgmental attitudes toward health issues (e.g., reproductive health, mental illness, or chronic diseases), and substandard quality of care based on perceived social status. The perceived lack of empathy and dignity critically eroded trust in healthcare providers and the system itself. Consequently, avoidance behaviors included delaying check-ups, self-medication, preferring informal or traditional healers, and refusing essential follow-up care. The study highlights the compounded vulnerability faced by women at the intersection of gender with other social markers. The findings underscore that perceived discrimination is a major and preventable public health crisis driving healthcare avoidance among women in Kolkata. It transforms the healthcare seeking process from an act of survival to a source of emotional trauma, perpetuating health disparities. The study strongly recommends gender and social-equity training for healthcare professionals, the establishment of accessible and confidential grievance redressal mechanisms, and system-level interventions focused on promoting dignified, non-judgmental, and culturally sensitive care to rebuild trust and ensure equitable access to health services for all women.

**Keywords:** Perceived discrimination, semi-structured interviews, self-medication, traditional healers, health disparities.

# Inequality between Roma and majority ethnic groups in terms of access to healthcare

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This research aims to highlight the problems faced by Roma and to initiate improvements in their access to healthcare, in order to reduce inequality between ethnic minorities and the majority population. Roma have represented a significant percentage of the world's population for a very long time, but they have been unable to integrate into society. This ethnic group has faced and continues to face discrimination, exclusion, insecurity, and deprivation, especially in the healthcare system. In addition to these problems, the precarious financial situation, lack of access to drinking water, hygiene, and decent housing prevail among Roma, along with linguistic and cultural barriers, which represent obstacles for Roma. The consequences of these inequalities between Roma and the majority population lead to lower life expectancy, infant mortality, chronic diseases, infectious diseases, sexually transmitted diseases, depression, and especially substance abuse among them. For Roma women, discrimination is twofold, as they are discriminated against on the basis of both ethnicity and gender. Well-designed and implemented policies such as information campaigns or vaccination campaigns can reduce the problems faced by Roma, but even they do not trust the health system because they have encountered prejudice and had negative experiences.

# Session 3

## *Parallel Session 4: Urban Health and Health Geography*

### Urban Walkability, Health and the Elderly: Evidence from Delhi

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As India's population ages, the intersection between urban design, mobility, and health becomes increasingly critical. This study explores the relationship between urban walkability and health outcomes among the elderly population in Delhi, drawing exclusively on secondary data sources. The objective is to assess how the built environment, particularly pedestrian infrastructure, accessibility, and safety affects physical activity levels, social engagement, and overall well-being of older adults.

This study adopts a descriptive analytical design based entirely on secondary data. Data were drawn from multiple credible sources, including the Census of India (2011) and National Sample Survey (NSS 76th Round, 2018) for demographic and health-related indicators; Comprehensive Mobility Plan for Delhi (2019) and Delhi Development Authority's Master Plan (MPD 2041) for urban infrastructure data; and the Ministry of Housing and Urban Affairs' Ease of Living Index (2021) for quality-of-life indicators. Walkability parameters such as pedestrian path density, road safety statistics, and access to green/public spaces were derived from OpenStreetMap and Delhi Transport Department datasets. A composite "Walkability-Health Index" was constructed using normalised indicators representing (a) physical environment (sidewalk quality, connectivity, green space per capita), (b) safety (road accident rates involving elderly pedestrians), and (c) health outcomes (mobility-related morbidity, self-reported activity levels). Correlation and regression analyses were applied to identify associations between neighbourhood walkability and elderly health outcomes across different municipal zones. Findings reveal that areas with higher walkability particularly in Central and South Delhi showed significantly better self-reported physical health and higher participation in outdoor activities among older adults. Conversely, peripheral regions such as East and North-West Delhi demonstrated lower walkability scores, higher incidence of mobility-related ailments, and reduced social engagement. The analysis also highlights that poor pedestrian infrastructure, air pollution, and unsafe crossings disproportionately limit the mobility and autonomy of elderly residents. Gender and income disparities were evident, with elderly women and low-income groups facing greater barriers to walking-friendly environments. The study underscores that urban walkability is a vital determinant of healthy ageing in Delhi. Enhancing pedestrian infrastructure, improving safety, and integrating age-sensitive planning into urban design can significantly improve the health and well-being

of the elderly. Policymakers must prioritise walkability as a public health strategy within urban planning frameworks, ensuring equitable mobility and inclusion for all age groups.

**Keywords:** Walkability, Elderly Health, Delhi, Urban Design, Secondary Data Analysis

## Transit-Oriented Obesogenic Development in Delhi Metro: Mapping Junk Food and Urban Health Risks

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The growing prevalence of junk food consumption has emerged as a major urban health concern, particularly in rapidly urbanizing cities like Delhi. Characterized by high fat, sugar, and salt content, junk food is closely associated with obesity, diabetes, cardiovascular diseases, and declining mental well-being among adolescents and young adults. This study explores the spatial and behavioral dimensions of junk food consumption within the Delhi Metro transit system, framing it as a unique "transit foodscape" that intersects mobility, urban infrastructure, and public health. Drawing upon secondary data, policy documents, and empirical observations from major interchange stations, including Rajiv Chowk, Kashmere Gate, Hauz Khas, and Botanical Garden, the paper investigates how the Delhi Metro has become a site of everyday food consumption and informal vending, shaping dietary choices among commuters. Integrating concepts from urban health geography, mobility studies, and food environment research, the study examines the coexistence of formal food chains and informal vending networks that together constitute a diverse yet obesogenic food environment. Results highlight that metro-based foodscapes reflect broader socio-spatial inequities, where convenience, affordability, and marketing reinforce unhealthy dietary behaviors. Furthermore, the spatial redistribution of commuter footfall across new interchange nodes such as Hauz Khas and Botanical Garden has intensified food commercialization in peripheral zones, signifying a shift from central to polycentric transit-based consumption. The paper argues that addressing Transit-Oriented Obesogenic Development (TOOD) requires integrated urban policies that align transport planning, public health, and food environment governance. By conceptualizing the Delhi Metro as both a mobility network and an evolving urban food ecosystem, this study contributes to rethinking how everyday transit spaces mediate health risks, economic livelihoods, and urban sustainability in contemporary Indian cities.

**Keywords:** Delhi Metro, Transit foodscape, Junk food consumption, Urban health, Transit-Oriented Development (TOD)

# Urbanization, River Health, and Human Exposure: A Zonal Study of the Mahananda in Crisis – A Case of West Bengal, India

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This paper discusses the causes and impact of water pollution in the Mahananda River, especially in Siliguri, West Bengal, India. The Mahananda River is a trans-boundary tributary of the Ganges that originates from Paglajhora Falls in Darjeeling. It crosses a number of sensitive ecosystems such as the Mahananda Wildlife Sanctuary before entering Siliguri. This river, despite being one of the major sources of water, has undergone acute pollution owing to urban waste, encroachment, deforestation, and illicit sand mining. The width change of the river, land use dynamics, and resultant pollution impact were estimated in a zonal approach (Z: Zones), i.e. Z1 (Salugara), Z2 (Gurung Basti), and Z3 (Fulbari). Landsat images and statistical analysis indicate that there is a westward shift with shrinking of the river: Salugara has an annual decrease in width rapidly, while Fulbari presents a less significant trend; and Gurung Basti depicts a minor yet consistent dwindling.

A land use analysis from 1994 to 2023 indicated clear-cut forest loss and the expansion of built-up areas in both Fulbari and Salugara. In this regard, the green cover was degraded by 13.2% in Fulbari and 26.4% in Salugara, while the built-up areas were increased by 70.4% and 109.6%, respectively. These changes correspond to an increase in runoff and sediment yield as high as 47.6% in Salugara and 42.3% in Gurung Basti, thus compromising river health and increasing flood risks. The NSF-WQI-based water quality assessment shows that scores drop from upstream at Z1 (74.7) to downstream at Z3 (below 61) due to increases in BOD, COD, and phosphate. Local contributions include greywater and animal wastes from Gurung Basti, high iron from Matigara, and phosphate from Fulbari. Despite these, various community-led initiatives in Ward 3, like river cleanup during Chhath Puja and spiritual engagement in Ganga Aarti, do indicate promising grassroots-level stewardship. The study concludes with a critical review of the Mahananda River Action Plan and goes further to propose integrated mitigation strategies through regulation in land use, ecological restoration, and participatory governance. This research underlines the dire need for sustainable urban planning and inclusive environmental management so as to restore ecological integrity and safeguard public health in Siliguri with regard to the Mahananda River.

# Session 4

## *Parallel Session 1: Environment and Health*

### Environmental Pollution and Human Health: Assessing Microbial Pollution and Disease Prevalence in the East Kolkata Wetlands

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The proliferation of antibiotic-resistant bacteria (ARB) in wastewater-impacted environments poses a critical threat to public health, particularly when compounded by toxic metal contamination. This study investigates the microbial pollution load, existence of metal tolerance and antibiotic resistance among bacterial isolates from the East Kolkata Wetlands (EKW), a Ramsar-recognized, wastewater-fed ecosystem. Water samples from 13 locations of EKW were analyzed for bacterial load, morphology, heavy metal tolerance (Hg and Cr), and susceptibility to commonly used antibiotics (ampicillin, amoxycillin, gentamicin, rythromycin). Results revealed a high prevalence of Gram-negative coliforms, including potentially pathogenic strains. Bacteria showed greater resistance to chromium than mercury, while ampicillin emerged as the most effective antibiotic across isolates. Survivability tests confirmed dose-dependent declines in bacterial viability, with Bacillus cereus displaying the highest tolerance. Furthermore, a door-to-door health survey of 1823 residents showed a significant disease burden among wastewater users, with 21.18% reporting bacterial infections. Chronic illnesses affected over a fourth of users, averaging 158 days/year, while acute conditions were more prevalent but shorter-lived. Commonly reported ailments included vomiting, conjunctivitis, diarrhoea, and skin diseases, correlating strongly with wastewater exposure. This study highlights the interconnected risks of environmental pollution, microbial resistance, and human health in peri-urban wetlands, underscoring the need for improved wastewater management, regular health surveillance, and informed policy responses.

**Key Words:** Wastewater, East Kolkata Wetlands, Antibiotic resistance, Metal resistance, Human Health Implications.

## Urban EcoScore Index-Based Assessment of Biophilic Conditions and Natural Habitability of Kolkata Metropolitan Area using Enhanced Indices and Machine Learning

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Urban sustainability assessment has become vital given the accelerating urbanisation and environmental strain, especially in the Kolkata Metropolitan Area (KMA), where land-use changes and human activities drive ecological degradation. This research attempted to assess the Urban EcoScore Index (UESI) as a novel method for evaluating the biophilic conditions and natural habitability of the KMA by integrating six key ecological indicators (Human Disturbance Index (HDI), Ecologically Resistant Surface (ERS), Modified Remote Sensing Ecological Index (MRSEI), Building Effect Index (BEI), Proximity Intensity Index (PII), and Species Richness (SR) for a comprehensive urban assessment. This assessment utilises remote sensing and machine learning, specifically the Random Forest (RF) algorithm, to model intricate ecological relationships and Explainable AI (XAI) techniques, specifically Shapley Additive exPlanations (SHAP) analysis, to interpret these models and elucidate non-linear relationships. The UESI assessment revealed spatial disparities across the KMA, with 22% (384 km2) being classified as poor in highly urban cores with degraded ecosystems. In contrast, 25% (433 km2) of the KMA fell under the good category, whereas an additional 9% (151 km2) achieved excellent conditions (UESI > 0.8), primarily in ecologically sensitive zones such as the East Kolkata Wetlands (EKW). Intermediate zones—Fair (445 km2, 26%) and Moderate (339 km2, 20%)—highlight transitional areas where targeted restoration could enhance ecological functionality. The SHAP-based assessment showed that the SR and HDI drive UESI variability, highlighting biodiversity conservation and reducing anthropogenic pressure for urban sustainability. This study advocates strategic biophilic interventions, including natural landscapes, biodiversity corridors, and nature-based solutions. The UESI framework aids urban planners in identifying ecological priority zones and guiding climate-adaptive planning and sustainability goals, making it crucial for urban governance and enabling the KMA to tackle environmental issues and achieve SDG targets.

**Keywords:** Biophilic urbanism, Kolkata Metropolitan Area (KMA), machine learning, Natural Habitability, Urban EcoScore Index

## Traditional Water Sources in Chamoli District: The Importance of Naula and Dhara

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Chamoli district in Uttarakhand, India, is renowned for its rich cultural heritage and traditional water management systems. For centuries, the local communities have relied on ancient

water sources, known as “Naula” and “Dhara,” to sustain their livelihoods. These traditional water sources have played a vital role in supporting agriculture, domestic use, and spiritual practices. Despite the advent of modern water supply systems, Naulas and Dharas continue to hold significant cultural, spiritual, and ecological importance. This study aims to explore the significance of Naulas and Dharas in Chamoli district, highlighting their role in maintaining water security, promoting sustainable livelihoods, and preserving cultural heritage. Through a comprehensive review of existing literature and field observations, this research paper examines the historical context, cultural significance, and ecological importance of these traditional water sources. The findings suggest that Naulas and Dharas are not only a source of clean water but also an integral part of the local ecosystem, supporting biodiversity and maintaining the hydrological balance. Moreover, these traditional water sources are deeply intertwined with the cultural and spiritual practices of the local communities, reflecting the region’s rich cultural heritage. The study concludes that Naulas and Dharas are essential components of Chamoli’s water culture, requiring conservation and preservation efforts to ensure their sustainability. The research highlights the need for a holistic approach to water management, incorporating traditional knowledge and practices with modern technologies to promote water security and sustainable development in the region.

**Keywords:** Traditional water sources, Naula, Dhara, Chamoli district, Uttarakhand, water culture, sustainable livelihoods, cultural heritage.

## Can local farms sustain Thai school lunches? A qualitative exploration of challenges and solutions

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School lunch programmes are a critical determinant of children’s health, supporting growth, learning, and long-term well-being. However, integrating locally sourced ingredients into these programmes remains a challenge in many low- and middle-income settings, including Thailand, where budget constraints and logistical barriers often limit schools’ ability to procure fresh produce from nearby farms. This study aimed to investigate the spatial and organisational factors influencing the integration of local farms into school lunch programmes in Chiang Mai, Thailand, to identify strategies to strengthen farm-to-school linkages. A qualitative research design was employed, combining geospatial and thematic approaches. Nineteen in-depth, semi-structured interviews were conducted with 13 school staff responsible for lunch programme management and six local farmers in Saraphi and Hang Dong districts. Road network distance analysis was performed using QGIS 3.38.3 to calculate the shortest travel distances between schools, markets, and farms, providing a spatial measure of food access and procurement feasibility. Interview transcripts were analysed thematically to identify key patterns, which were then organised using a SWOT (Strengths, Weaknesses, Opportunities, Threats) framework to capture internal and external factors influencing local food sourcing. A TOWS (Threats, Opportunities, Weaknesses, Strengths) matrix was subsequently used to develop spatially informed, context-specific strategies to enhance school–farm integration. Findings indicate that schools benefit from

strong community engagement, well-established procurement practices, and proximity to local markets, which together create opportunities for farm-to-school collaboration. Nevertheless, several barriers constrain implementation, including seasonal variability of produce, inconsistent supply from smallholder farms, limited storage infrastructure, and a fixed daily meal budget of 21 baht per child. The spatial analysis highlighted variation in school proximity to markets and farms, with some schools located near local suppliers while others relied on distant central markets, increasing procurement challenges. The study demonstrates the value of combining geospatial analysis with participatory qualitative methods to inform local food system planning. It highlights the need for policies that leverage community resources, formalise school–farmer agreements, and provide logistical support such as transport subsidies or shared distribution systems. Strengthening these partnerships can improve children's nutritional intake, enhance food system resilience, and reduce environmental impacts associated with long-distance food transport.

This research contributes to health geography by illustrating how spatial accessibility, community dynamics, and institutional structures interact to shape food environments in semi-urban Thailand. It provides actionable, geographically grounded strategies for policymakers, schools, and local producers aiming to scale up farm-to-school initiatives and improve equity in access to healthy school meals.

**Keywords:** School lunch programme, Local sourcing, Farm-to-school, SWOT, TOWS.

# Session 4

## Parallel Session 2: Environment and Health & Health Geography

### Unmet need for Caesarean section deliveries in Akure, South Western Nigeria, a reality or a myth

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Caesarean Section (CS), a surgical alternative to vaginal childbirth, is a critical intervention to reduce maternal deaths during at-risk childbirth. Nigeria has the third highest maternal mortality ratio globally. Ondo State's Abiye programme provided free Maternal, Newborn and Child Health (MNCH) services to pregnant women. However, there is limited knowledge on how best to determine optimum CS rates and address unmet need for this service towards saving pregnant women's lives. This study examined the unmet need for CS inAkure, Ondo State.

Longitudinal assessment was carried out on hospital records of pregnant women obtained from Mother and Child Hospital Akure (the first and largest MNCH specialist tertiary health facility) between 2013 and 2017 when free MNCH services (Abiye programme). Ethical approval was received from the Ondo State Ministry of Health, the hospital and the University of Ilorin, Nigeria. Data obtained were analyzed using linear regression, local indicators of spatial autocorrelation (LISA) to determine unmet need for CS and mapped.

The findings of the study were that:

i. caesarean section rates increased from 16.83% to 22.7% between 2013 and 2017 in Akure. Optimum CS rate was 21% while notable spikes of unmet need were in July 2014 (14%), August 2015 (10%), July 2016 (16%) these were period of health workers' strike; and
ii. Ogbese ward had a cluster of high met CS needs and 19(68.4%) of wards had unmet need for CS

The study concluded that Akure had high unmet need for CS though local variations were observed within the city.Underperforming wards should be targeted with appropriate interventions to improve CS delivery uptake, thus reducing maternal mortality.

**Key words**: maternal mortality, caesarean section

# Ecological and Human Health Risk Assessment of Heavy Metal Contamination and Its Impact on Antioxidant Enzyme Activity in Rainbow Land Crab (Cardisoma armatum) from Western Lagos Lagoon, Nigeria

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Rainbow land crab (Cardiosoma armatum) in the Western Lagos lagoon was used for monitoring heavy metal pollution in the Western Lagos Lagoon (UNILAG Waterfront and Makoko). All the enzymatic biomarkers measured have higher mean concentration in UNILAG Waterfront (PRO=18.62, SOD=30.17, MDA=4.85, CAT=4.30, GST=1.25) than Makoko. The t-test shows that SOD is not significant (0.338) p>0.05. The result showed that zinc and cadmium are significant in both locations in the crab tissue while lead is insignificant in both locations. The mean concentration of heavy metals in tissue showed that zinc and cadmium was higher in Makoko than in UNILAG. Lead is higher in UNILAG than in Makoko. In the sediment, the mean concentration showed that all the heavy metals were higher in UNILAG than in Makoko. Metal concentrations in the tissues were utilized to assess the estimated daily intake (EDI), target hazard quotients (THQ), hazard index (HI), cancer risk (CR), Safe Consumption Rate (CRLim). EDI lead values for adults were 0.0053 and 0.012 for UNILAG, while for Makoko, the values were 0.0012 and 0.0027. For Zinc EDI in UNILAG, values were 0.0045 and 0.011, while for Makoko Zinc EDI values were 0.0016 and 0.0037. For Cadmium, EDI values were 0.0045 and 0.011 for UNILAG and 0.00075 and 0.0018 for Makoko respectively. These results were for Adults and Children in that order. The THQ of Lead and Cadmium (for children) were above the threshold value of 1, raising a cause for concern. This concern was also reflected in the HI- (HI>1). Cancer risks from the results are unacceptable, since they are higher than 10-4. This is also reflected in CRLim results. However, these results might be skewed due to use of whole crabs as the analytical unit, which might not accurately reflect the spread of heavy metals in specific edible parts, leading to a possible overestimation or an underestimation of health risks. Future studies could give more accurate assessments of potential health hazards. Apart from this, spatio-temporal limitations and socio-economic considerations can be recommendations for future studies.

**Keywords**- Ecological and human health risks, Enzymatic Biomarkers, Heavy metals, Rainbow Land Crab (Cardisoma armatum), Western Lagos Lagoon.

# Session 4

## *Parallel Session 3: Health Geography*

### Geospatial Inequalities in Access to Primary Healthcare in Rural Gombe State, Nigeria

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Access to primary healthcare (PHC) in rural Nigeria remains constrained by spatial and infrastructural disparities that undermine equitable health outcomes. This study examines the geospatial inequalities in access to PHC services across rural Gombe State through a mixed-methods approach integrating spatial analytics and community perspectives. Quantitative data were drawn from the National Bureau of Statistics, OpenStreetMap, and the Gombe State Primary Health Care Development Agency, and analysed using ArcGIS and the two-step floating catchment area (2SFCA) model to estimate accessibility within a 5 km threshold. Results indicate that approximately 58% of the rural population resides within the recommended 5 km radius of a PHC facility, while 42% notably in Yamaltu-Deba, Funakaye, and Shongom Local Government Areas, travel between 8 and 15 km to the nearest facility. Accessibility showed a strong positive correlation with road density ($r = 0.72$, $p < 0.01$), emphasising the role of physical connectivity in healthcare reach. Qualitative insights from 45 community members and 12 healthcare workers revealed that poor roads, transport scarcity, and seasonal flooding significantly limit access, particularly for women and children. Participants described healthcare as “physically near but socially distant,” reflecting how affordability, mobility, and information gaps further constrain service utilisation. These findings demonstrate that geographic proximity alone does not ensure access; instead, spatial, infrastructural, and socio-economic inequalities intersect to shape rural health experiences. The study underscores the need for integrated spatial planning, improved transport infrastructure, and participatory health governance to achieve equitable and resilient health systems. Addressing these inequalities aligns with planetary health goals that seek to build inclusive and sustainable well-being across human and environmental systems.

**Keywords**: Health geography, spatial inequality, primary healthcare, rural health, GIS, Gombe State, planetary health

# An Analysis of Spatial Distribution of Stroke, Hypertension, Congestive Cardiac Failure, Dilated Cardiomyophathy And Post Partum Cardiomyopathy In Kano Metropolis Nigeria

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This paper reviewed 20 years cardiovascular diseases admissions from 1st January, 2004 to 31st December 2023. Over period of twenty years, the study examined a total of 16038 admissions. This study used purposive sampling technique in selecting the facilities. Three tertiary hospitals for the study. These facilities are Amimnu Kano Teaching Hospital Murtala Muhammad Specialist Hospital MMSH and Muhammad Abdullahi Wase University Teaching Hospital, The following variables were captured from the case files: date diagnosis, occupation, gender, age and residential addresses Spatial maps were produced using. Arc GIS 10.2 software. Statistical Package for Social Science 20.0 was used in testing the hypotheses. The result indicated that cardiovascular diseases cases across the Kano Metropolis revealed that cardiovascular diseases varied significantly within Kano Metropolis. The results indicated that Nassarawa local Government Area has the highest number of reported congestive cardiac failure (CCF) with about 353 cases which accounted for (16.6%). The result also revealed Kano Municipal Council has the highest cases of hypertension in Kano Metropolis with about 1142 cases (16.0%) The findings also indicated th, difference in the number of cardiovascular diseases in Kano Metropolis with (p-value = < 0.001). The study recommends for specific area intervention to address the increase in the number of cardiovascular diseases.

**Keywords**: Analysis, Spatial Distribution, Stroke, Hypertension, Congestive Cardiac Failure. Dilated Cardiomyophathy, Post partum Cardiomyopathy, Kano Nigeria

# Theater as an inclusive space: A study on accessibility and therapeutic potential for people with physical disabilities

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The purpose of this research is to investigate the impact of artistic practices with a focus on theater on people with physical disabilities, examining both the therapeutic and social dimensions and the condition of physical accessibility (transportation and the theatre's building infrastructure). The presentation aims to highlight how these activities, carried out in an appropriate and accessible space, can manage mental health and facilitate social inclusion and the creation of one's own identity. The objectives of this presentation are: to identify the psychological benefits (self-esteem, emotion management) resulting from participation in artistic workshops; to analyze the impact on social skills and group cohesion; analyzing

perceptions of accessibility barriers (transportation and building access) and how they help overcome barriers and build a positive identity. The research was based on a mixed approach using a literature review of existing research in the fields of art therapy, positive psychology, disability studies, and physical accessibility, and a qualitative research tool was developed. The questionnaire, distributed to people with disabilities, included open-ended questions designed to highlight perceptions and nuances of personal experiences, as well as aspects related to the accessibility of the theater's infrastructure and space. The results will indicate that artistic practices are perceived as a catalyst for improving their emotional state, increasing self-confidence, and developing social support networks. When physically accessible, the theater becomes a safe space, with an essential language for expression, which will counterbalance the isolation and stigmatization of people with physical disabilities.

**Keywords:** artistic practices, therapeutic and social dimension, physical disabilities.

## Correlation of Stress and Academic Achievement Among Higher Secondary Level Students at Selected School in Tholannur, Palakkad District, Kerala, India

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Stress is widely recognized as a significant factor influencing students' academic outcomes and overall mental health, making it essential to understand its correlation with academic performance. This study focuses on examining the relationship between academic stress and academic achievement among secondary school students at Tholannur School in the Palakkad district. The study also investigates the role of gender in shaping this relationship, aiming to explore how male and female students experience stress differently and how it impacts their achievements. The objectives of the study follows : to measure the correlation between stress levels and academic achievement. To analyse gender differences in this correlation, and suggest practical ways to reduce stress for better academic outcomes. Understanding these dynamics is critical for improving student well-being and academic success within the educational environment. The study area comprises : secondary-level students enrolled at Tholannur School, which provides an appropriate sample representing diverse socio-economic backgrounds in the Tholannur school. The school's academic environment and student population make it a suitable location to explore the pressures associated with secondary education. Methodology of the study adopts a quantitative approach, collecting primary data through structured questionnaires that assess students' stress levels and academic performance indicators. Academic achievement data are obtained through students' recent exam scores. The Karl Pearson Correlation Coefficient is applied to analyze the strength and direction of the relationship between stress and academic achievement. Additionally, the study examines gender as an important factor to assess differential experiences and impacts of stress on male and female students. Finally, the study aims to provide recommendations for reducing academic stress, including stress

management initiatives, supportive counselling, and creating a balanced academic environment, thereby enhancing students' academic performance and mental well-being.

**Keywords:** Academic stress, Academic achievement, Karl Pearson Correlation Coefficient, Gender differences, Secondary students, Palakkad district, Stress reduction strategies

# Session 4

## *Parallel Session 4: Health Geography*

### Invisible Inequalities: Maternal and Child Health Challenges in Marginalized Communities of Rajasthan in 21st Century

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This abstract examines the persistent disparities in maternal and child health (MCH) within the marginalized Scheduled Caste (SC) and Scheduled Tribe (ST) communities of Rajasthan. While the state has made significant strides in overall health indicators, these improvements often fail to reach the most vulnerable populations, creating "invisible inequalities" that persist in the 21st century. The study highlights how systemic factors like poverty, illiteracy, geographical remoteness, and deeply ingrained social discrimination act as barriers to healthcare access and utilization. Despite national programs and state-level initiatives aimed at universal health coverage, data reveals a stark divide. According to the National Family Health Survey-5 (NFHS-5), while institutional deliveries have risen to 94.9% across Rajasthan, the figures for marginalized groups are notably lower, with 89.6% among ST women and 93.4% for SC women. The Infant Mortality Rate (IMR) for children born to mothers in the lowest wealth quintile is 49.4 per 1,000 live births, nearly double the rate of 25.2 for those in the highest quintile. Furthermore, only 76.6% of SC women and 71.9% of ST women received antenatal care (ANC) from a skilled provider, compared to the state average. These figures underscore that modern healthcare advancements have not effectively dismantled the deep-seated social and economic barriers faced by these communities. This research argues that a one-size-fits-all approach to public health is insufficient. It emphasizes the need for tailored, culturally sensitive interventions that address the unique challenges of these communities in a rapidly changing world. By shedding light on these invisible inequalities, this study aims to inform policymakers and public health practitioners on the critical need to strengthen the healthcare infrastructure and tackle the underlying social determinants of health to ensure equitable Maternal and Child Health outcomes for all.

**Keywords**: marginalized, communities, inequalities, health

# Using geospatial analysis to identify gaps in metropolitan healthcare services accessibility

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Access to healthcare services in metropolitan areas is a discussed subject in many developed or developing countries, especially in a post-socialist state, with numerous problems of sanitary infrastructure. In many cases, access times of the population to medical infrastructure can reach alarming results in areas like Bucharest-Ilfov, where densely populated sections still remain without a good access to basic healthcare services. Geospatial analysis can allow the identification of accessibility barriers and gaps in territorial systems. In this study, geocoding tool was used for creating a metropolitan medical facilities data base, divided into three categories (primary, secondary and tertiary care), which were the basis for network analyst analysis, used for calculating timing areas and accessibility classes. Following five accessibility scenarios, depending by the traffic hour, the study quantifies different accessibility results, which are later raported to demographics. The results show that even when accessibility infrastructure can constantly improve and expand inside the metropolitan area, at peak times and even during off-peak hours, access can gracefully exceed critical times, especially in the case of tertiary care units, which are usually situated mostly only in the metropolitan core. However, the peripheral localities of metropolitan area, that contains mainly in rural population, facing aging and lower incomes are registering very low values for all scenarios. Gap areas in accessibility to different medical facilities are more than visible, proving that the need to plan medical infrastructure according to the real demand in the territory is critical.

**Keywords**: geospatial, accessibility, GIS, healthcare, basic services

# Mapping High School Commutes: Living in Education Deserts and Its Effect on the Population

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The present paper maps “education deserts” in Romania - places where students lack reasonable access to education - and asks how spatial barriers intersect with local vulnerability. Education matters for human capital, health, and civic outcomes; where schools are distant, attainment and prospects suffer. We delineate education deserts using a 20-minute travel-time threshold to the nearest accredited high school, computed on street-network travel via GIS with open routing data. To capture more than mere proximity, we build two normalized indices: a Composite Demand Index and an Access Hardship Index. These combine into an Educational Desert Index that prioritizes places with both high need and weak access. Nationally, deserts cluster in rural and peripheral LAU2s; roughly a third of settlements fall beyond the threshold and about one in six high-school-age youth live in such

areas, with especially large pockets in North-East, South, Centre, and North-West regions, and minimal exposure in Bucharest-Ilfov. Findings indicate that living in education deserts reflects not only distance but sparse school options and structural educational deprivation. We conclude that targeted transport and school-network policies such as bus service, catchment redesign, selective new dorms are essential to reduce spatial injustice and improve pathways to graduation.

**Keywords**: High School, GIS, Education

## The Uneven Geography of Healthcare in Maharashtra, India: A Socio-Spatial Analysis of Inequalities

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Healthcare inequalities remain a major barrier to achieving inclusive human development, particularly in countries like India. These disparities are shaped by intertwined socio-economic, demographic, and spatial factors, resulting in uneven access to healthcare services across regions. Maharashtra despite being one of India's economically advanced states exhibits pronounced internal disparities, making it a critical site for examining the uneven geography of healthcare access. This study utilizes cross-sectional secondary data and multivariate statistical methods to develop a Composite Healthcare Index (CHI) incorporating dimensions of availability, amenities, and affordability. The results reveal marked socio-spatial inequalities: while districts in Konkan and Western Maharashtra show relatively high levels of healthcare access, large parts of Vidarbha, Marathwada, and North Maharashtra experience significant deficits in services and infrastructure. Hotspot analysis (Getis-Ord Gi*) highlights clustered patterns of advantage and disadvantage, with high-access clusters concentrated in the west and persistent cold spots in the interior regions. Regression analysis identifies per capita income and literacy as major determinants of healthcare outcomes, emphasizing the influence of economic capacity and human capital. The study suggests that generalized policy strategies are inadequate and advocates for region-specific planning aligned with Sustainable Development Goals to address these entrenched disparities.

**Keywords**: Healthcare, Spatial, Inequalities, Hotspot analysis, Sustainable Development.

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