GROUP ON EARTH OBSERVATIONS

Earth Observations for Health (EO4HEALTH)

GEO HEALTH COMMUNITY OF PRACTICE

John Haynes, USA, NASA (Chair)

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Unique Value of EO4HEALTH

- **Mission:** To foster the development of integrated information systems that improve the capacity to predict, respond to, and reduce environment-related health risks.

- **Goal:** To support the systematic collection, analysis, and application of relevant information about areas of impending risk that inform the development of strategic responses to anticipate risks and opportunities and their evolution and communicate options to critical actors for the purposes of decision-making and response.

- **Objectives:**
  1) Engage with end-user communities to better understand and identify their needs and requirements.
  2) Develop and implement activities that address the needs and requirements of end-user communities.
  3) Improve the use of, and clarify future needs for, EO for health.
  4) Examine effectiveness and provide feedback on future EO actions for health.
  5) Participate with other individuals or GEO communities of practice or institutions to produce an outcome greater than that achievable otherwise.

Key Results Achieved in 2017-2019

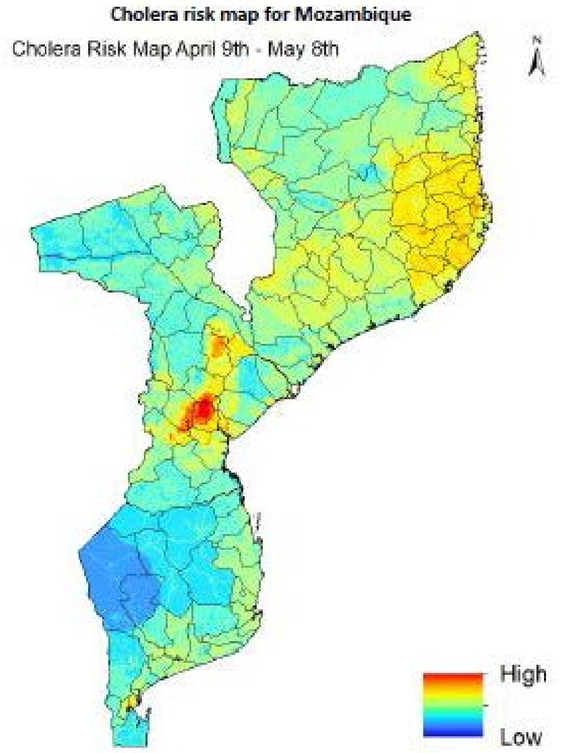
Lead	Title	Benefit to GEO
Antarpreet Jutla (West Virginia U.)	Predictive Assessment of Transmission Conditions of Cholera	Developed models with a weekly time step for the epidemic model of cholera and included newer datasets; Model tested in the countries of Algeria, Zimbabwe, and Mozambique; Added partners - UNICEF and the Department for International Development, UK.
Tatiana Loboda (U. of Maryland)	Myanmar Malaria Early Warning System	Developed methodologies and datasets for the compilation of the baseline land cover and land use map and development of environmental monitoring capacity; Coordinated with Duke Global Health Institute (DGHI) Myanmar office where the model will be transferred upon completion; Initiated capacity building activities
John Malone (Louisiana State U.)	Geospatial Surveillance for Vector-Borne Disease	Provide initial databases and template for GIS project studies for six countries in Latin America; Standard Operating Procedures/Tutorial written for on-line data access and similar analysis; Results from risk model mapping of visceral leishmaniasis (VL) indicate direct measurement of soil moisture by SMAP can be used in lieu of models calculated from standard thermal and precipitation climate station data.
Benjamin Zaitchik (Johns Hopkins U.)	Environmental Determinants of Enteric Infectious Disease	Assessed performance of relevant EO at MAL-ED sites; Implemented EO-informed predictive models of enteric pathogens (e.g., Rotavirus); Added clinical and public health specialists to the team.

Highlight: Predictive Assessment of Transmission Conditions of Cholera in the Environment and Human Population using Earth Observations

PI: Antarpreet Jutla (West Virginia University)

Map of Mozambique. Credit: WHO, 2019

- Through this and previous research, Dr. Jutla's team developed a cholera algorithm to predict cholera risk in Yemen, Algeria, and Zimbabwe.
- Unanticipated natural event: Tropical Cyclone Idai made landfall in Mozambique (27.9M population in 2017) on March 14-15, 2019. Tropical Cyclone Kenneth struck the country on April 25, 2019.
- Based on available preliminary disease data from Mozambique (by UK DfID and others), Dr. Jutla's team was able to accurately predict cholera risk at least four weeks in advance in Beira, Dondo, and Nhamatanda. This map is generated using data on precipitation (GPM, TRMM), population (ORNL LandScan), and temperature (MERRA2).
- As they wait to validate this model further with real-time data, they are working with regional stakeholders (UNICEF, UK DfID) and providing these risk maps so that appropriate access to safe water, sanitation, and general hygiene education is made available to Mozambique citizens.



Cholera risk map for Mozambique, from April 9 to May 8, 2019, in the wake of Cyclones Idai and Kenneth. Credit: Antarpreet Jutla, 2019

Key Milestones and/or Deliverables for 2020-2022

EO4HEALTH Project/Lead	Deliverable to GEO (By 2021)	Description of Deliverable
Myanmar Malaria Early Warning System (Tatiana Loboda, U. of Maryland, College Park)	A robust satellite data driven early warning system to forecast malaria hotspots dynamically in space-time in Myanmar.	This approach and data fusion from multiple moderate and coarse resolution optical and microwave sensors will allow for an 8-day system update period with mapping primarily at moderate resolution that is relevant to village-scale assessments.
Environmental Determinants of Enteric Infectious Disease (Ben Zaitchik, Johns Hopkins U.)	A database of relevant climate, hydrology, ecology, and human activity at study sites.	This database will be used to develop statistical models of high impact enteric infectious diseases, with the goal of informing understanding, monitoring, and prediction at MAL-ED sites.
Predictive Assessment of Transmission Conditions of Cholera in Environment and Human Population (Antarpreet Jutla, West Virginia U.)	Prediction of the risk of cholera outbreak (trigger and transmission) in the environment and human populations in Africa.	Focusing on AfriGEOSS regions, this project aims to systematically validate the epidemic and endemic cholera hypothesis for the trigger component of cholera and develop, calibrate, and validate a predictive model for the transmission component of cholera.
Geospatial Surveillance and Response System Resource for Vector-borne Disease in the Americas (John Malone, Louisiana State U. and A&M College)	Characterization of the environmental suitability and potential for spread of selected endemic and epizootic vector-borne diseases in the Americas.	This project aims to develop prototype geospatial models on visceral leishmaniasis, an expanding endemic disease in Latin America, as well as *Aedes aegypti*-borne arboviruses (dengue, zika, chikungunya), that have potential for epizootic spread from Latin America and the Caribbean and establishment in North America.

Good Practices and/or Lessons Learned

Ensure user engagement for co-design and co-production

- ❑EO4HEALTH supported working groups, meetings, and telecons of the GEO Health Community of Practice (CoP), to facilitate the development and implementation of EO S&T in the health sector across a diverse set of topics. These working groups also informed the CoP Work Plan and the EO4HEALTH Initiative Implementation Plan. Website: http://www.geohealthcop.org/ *(See Poster for more!)*
- ❑Capacity-building activities, to engage stakeholders and promote the use of EO data in health decision-making:
  - ❑Individual level: Highlight and organize sessions/town halls at upcoming international conferences and meetings (e.g., GEO, AGU, EGU, APHA) and participation in short-term virtual or in-person continued education courses (e.g., NASA ARSET).
  - ❑Organizational level: Disseminate EO data tools, services, and other resources of the US/international space-based remote sensing community (e.g., NASA EOSDIS, ESA Copernicus, NASA HAQAST).
  - ❑Institutional level: Facilitate communication (e.g., GEO Health CoP) and encourage the development of project proposals and other initiatives of researchers and practitioners across scientific disciplines, sectors, and institutions to seek collaborations that promote the use of EO data and technology to diverse end-user communities.

Requests for Assistance

- A permanent Health point of contact at the GEO Secretariat would be beneficial to EO4HEALTH and the entire Community of Practice.

- Connections with AmeriGEOSS would be greatly improved if Health was named as an AmeriGEOSS Thematic Community.

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