



AWARD-APR

Addressing Extreme Weather Related
Diarrheal Disease Risks
in the Asia Pacific Region

Newsletter
Issue 3
April 2022

Belmont Forum Collaborative Research

ADDRESSING EXTREME WEATHER RELATED DIARRHEAL DISEASE RISK IN THE ASIA PACIFIC REGION

DEAR READER,

WELCOME TO THE AWARD-APR PROJECT'S THIRD NEWSLETTER!

We hope this newsletter finds you well.

We are now at the mid point of our three-year project. Despite the ongoing challenges, we have made significant progress as a team, thanks to the hard works of everyone involved. You can read about progresses we have made in each of the five work packages outlined below.

As we head towards the second half of our project, we will be shifting our focus to dissemination of our hard work. In that regard, we will be reaching out to each of our in-country partners to better strategize how we may achieve that.

We also want to report that our manuscript linking large scale weather phenomenon (monsoon anomaly, ENSO) with diarrheal disease in Nepal has officially been accepted by PNAS Nexus. Thank you everyone for your hard work, particularly our Nepal Team led by Dr. Dhimal. We will share the electronic copy of the manuscript when it becomes available.



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USA



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Chuansi Gao, PhD, Project Co-PI
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Project actuality: climate anomalies across the world



16 March 2022 Australia
More Deadly Floods Hit New South Wales



15 February 2022: The Guardian
US west "megadrought" is worst in at
least 1,200 years, new study says



21 March 2022 Mozambique
Death Toll From Cyclone Gombe Rises to
More Than 50

Project in short

Funders

- Belmont Forum
- National Science Foundation, USA
- Ministry of Science and Technology, Taiwan
- Swedish Research Council for Health, Working Life and Welfare, Sweden

Countries involved

- | | |
|----------|--------------|
| • USA | • Vietnam |
| • Sweden | • Nepal |
| • Taiwan | • Bangladesh |
| • India | • Indonesia |
| • China | • Malaysia |

Duration of the project

Sept 1, 2020 - Aug 31, 2023

Contact us

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Works in progress

WP1 - Status in April 2022

WP Leader: Amir Sapkota

WP1 team is now working to prepare sub-seasonal and seasonal (S2S) forecasts to be used in our early warning system under WP4. We have identified several S2S forecasts for this purpose, including the NOAA CFSv2 products ($\sim 1.0^\circ$ spatial resolution), the GloH2O Multi-Source Weather (MSWX) products (0.1° spatial resolution), and the JMA MRI-CPS3 products (currently not available for external users), to generate a 6-month ensemble S2S forecasts that provides range of uncertainty.

WP3 - Status in April 2022

WP Leader: Yu-Chun Wang

WP3 entails compiling historical diarrheal disease data. Since our last newsletter, we have added historical diarrheal disease data for several provinces of Indonesia.

WP4 - Status in April 2022

WP Leader: Amir Sapkota and Yu-Chun Wang

The team has been working to identify diarrhea risk associated with various weather variables. So far we have analyzed data of nine countries including Taiwan, Indonesia, Nepal, Vietnam, and five countries from Pacific Islands that are Fiji, French Polynesia, Kiribati, Solomon Island, and Tuvalu. As expected, the risk of diarrhea rate varies between countries as well as between various administrative units within the countries. A compiled manuscript with comparative results from these countries is under progress. Two separate studies from Taiwan and Surabaya, Indonesia are also in process of publication and identified increased diarrhea risk with weather factors variability. Further, spatial analysis of diarrhea incidence in Ahmedabad city of India, in association with local socio-demographic variables identified slum population density a significant risk factor. The study has been submitted for publication and is under review.

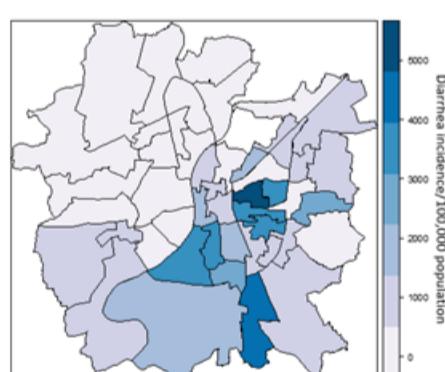


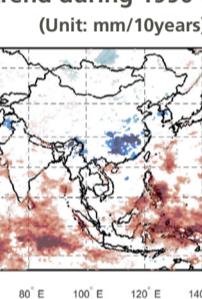
Figure: Spatial distribution of diarrhea incidence from 2010-2017, in Ahmedabad, India

WP2 - Status in April 2022

WP Leader: Chuansi Gao

The WP2 group has been working on detecting spatial-temporal variations of extreme precipitation and temperature, and their correlations with ENSO events. ERA5 reanalysis dataset from ECMWF is obtained for the study. R95P (annual total precipitation when daily precipitation $> 95^{\text{th}}$ percentile) is calculated as an extreme climate index. As shown in the Figure, trend analysis (Mann-Kendall test) and correlation analysis (Spearman correlation) by PhD student Dong An are applied to R95P and Oceanic Niño Index (ONI). The spatial patterns of significant trends have revealed regional variations of extreme precipitation, while the correlation map showed different association with ONI index. Temperature data and more statistical analysis will be involved in further studies.

Annual R95P with significant trend during 1990-2019



(Unit: mm/10years)

Significant correlation between annual R95P and ONI index

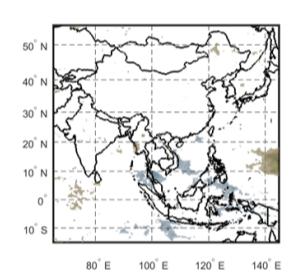


Figure: Spatial patterns of significant trends of annual R95P and significant correlation between annual R95P and ONI index.

WP5 - Status in April 2022

WP Leader: Amir Sapkota and Chuansi Gao

UMD team has been working tirelessly on refining their shallow timeseries neural network models so it can be successfully applied with environmental data to infer diarrheal disease risk with sub-seasonal and seasonal lead time.

Thus far, using historical diarrheal disease data from Nepal, Vietnam and Taiwan, the team has shown that such approach works well, at least to estimate historical cases (see Figure) and provide categorical probability of diarrheal disease prevalence (Low, Medium, High). The group is currently working to apply the same approach for estimating disease burden in the near future (weeks to months ahead).

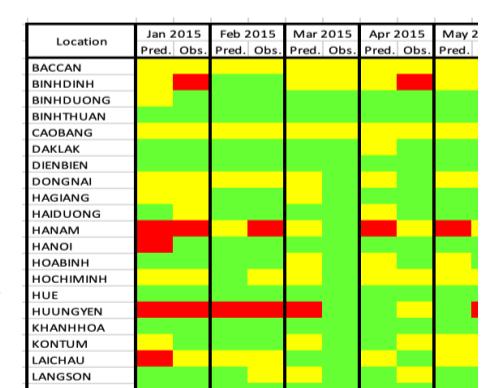


Figure: Section of heat map, Vietnam





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Team Sweden (WP2) welcomes new colleagues in the project

Associate Professor Linus Zhang



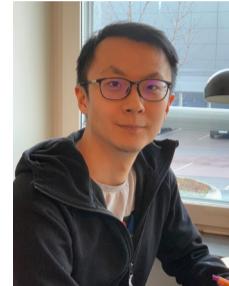
Linus Zhang is Associate Professor at Division of Water Resources Engineering, Lund University, Sweden. He received his Ph.D. in water resources engineering at Lund University in 1991. His research interests include integrated water resources management, arid-zone hydrology, advanced and high-performance hydrological modeling and unsaturated zone hydrology.

With over 30 year's experiences in researching, teaching and development in Sweden, he has combined experiences from Swedish and international perspectives.

Linus is the supervisor of PhD student Dong An, and a non-beneficiary senior researcher for WP2 with particular focus on extreme precipitation and flooding.

[Link to Lund University Research Portal](#)

Dong An, PhD Student



Dong An is a PhD student from Division of Water Resources Engineering, Faculty of Engineering, Lund University, Sweden. His PhD study is supervised by [Associate professor Linus Zhang](#), with focusing on extreme climate events concerning both floods and droughts.

He has working experiences at analyzing historical/future extreme precipitation variation at different scales and evaluating meteorological drought condition using drought index.

Dong has joined the project since December 2021. He will study the teleconnection between ENSO events and extreme precipitation and temperature events based on station level and ERA5 datasets, including their spatial-temporal variations and correlations with potential impact factors.

[Link to Lund University Research Portal](#)

Master students



Carly Latta studies at Lund University, and she is doing her Master's degree in Public Health. In her degree paper she examines how ENSO events can create weather conditions that impact the risk levels for diarrheal diseases in a region and how knowledge of this can help formulate future interventions. In the project she looks at ENSO, weather, and health data from Bangladesh and analyze the relationships between them.



Emanuel Svensson studies at Lund University, Faculty of Engineering. He is doing his Master's degree in Mathematical Statistics. In his degree paper he examines how extreme heat is influenced by ENSO index and then how extreme heat can affect health outcomes. In the project he helps with finding empirical relationships between extreme heat and ENSO index.



Kean Tang studies at Lund University, Center for Mathematical Science. He is doing his Master's degree in Mathematical Statistics. In his degree paper he examines the relationship between phases of ENSO and monthly temperature data in South East Asia. In the project he develops empirical relationships between phases of ENSO and frequency of extreme heat and/or extreme precipitation flooding events based on historical weather data, and further characterize how this relationship varies by geographic location and seasons in Asia-Pacific region.

Other news related the project



[YouTube video about the AWARD-APR project, June 10, 2020](#)

Enbel project



Enbel project is conducting literature review on differential vulnerability to climate change impacts by socio-economic status and gender implications, and is preparing an animation covering a few EU and Bel-mont projects including AWARD-APR.

New project calls:

The NIHR fifth Research and Innovation for Global Health Transformation (RIGHT) call on climate change and health services is now open. Closes: 13:00 GMT June 29, 2022.

The Wellcome Trust have launched an exciting call for proposals on Heat Adaptation: Evaluating interventions to help manage the health effects of heat (Deadline: May 31, 2022).



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