Assessing the social and environmental determinants of Emerging Infectious Diseases

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Outline

- Research Projects
- Progress Milestones
- Next Collaborative Research
1. Research Projects

(1) Assessing the social and environmental determinants of dengue outbreak and developing dengue early warning system based on spatial and temporal model.

(2) Estimating the impact of future climate change on the transmission of dengue fever and the associated disease burden in Australia and China.

(3) Developing One Health Workshop.
2. Progress milestones

- In August 2014, Prof. Lu visited QUT and attended in the “Establishment Ceremony of Australia-China Public Health Center and academic conference” in Australia.
• In October 2014, Prof. Hu visited Sun Yat-sen University for Dengue research project.

• In November 2014, Prof Lu invited Prof. Hu to visit China and give a presentation as a key speaker in “International Symposium for One Health Research”, which was held together by SYSU, SCAU and DU.
• Co-supervising a full-time PhD student who will visit QUT for 3 months
3. Submitted research proposals

(1) National Health and Medical Research Council 2015 project grant (under review)
Title: Assessing and model forecasting the impact of Climate change, Social Ecological Environment and Human Movement on Dengue transmission
(3) Science and Technology Plan Projects in Guangdong province

Title: New Strategies of the Emerging Infectious Diseases for Prevention and Control based on One Health Concept’’.
4. Publications and award

- Liu K et al. Assessment of dengue fever incidences in Zhongshan, China: time series regression tree threshold analysis. Accepted. 2015 International Society for Environmental Epidemiology (ISEE2015)


- Liu K et al. The Second Prize of Student Research Competition. 2014 International Symposium of One Health Research, China.
4. Publications and award

- Two research papers manuscripts have completed which would be benefit for the further collaboration.

  ① One of the paper manuscript is “Risk assessment of Dengue fever incidences in Zhongshan, China: time series regression tree threshold analysis.”

  ② Another research paper manuscript is “Can the Dengue Epidemic Happened in Guangzhou be a Reminder of Zhongshan’s Epidemic?”
Results--

Zhongshan city, Guangdong, China
latitude: 22.515847° N,
longitude: 113.392207° E

The annual mean temperature: 21°C - 23°C
The annual total precipitation: 2010mm

Figure 1  Study site of Dengue fever research

Figure 2  The regression tree modeling between autochthonic Dengue fever cases and the climate factors, Breteau Index and dates interval between onset and diagnosis
5. Future Collaborative Research

a) Establishing the collaboration platform and developing long-time collaboration research focusing on infectious diseases.

b) Co-supervise full-time students, including master and doctor candidates.

c) In November 2015, “One Health Workshop in China“ will be held in SYSU which is jointly organized by QUT, UQ and SYSU.
Research Aim

• We propose the use of a novel dynamic geographic information system (GIS)-based spatiotemporal modelling approach for developing dengue fever early warning system and projecting the likely impact of future climate change on dengue fever transmission.
Specific Aims

• To assess potential socio-ecological predictors (climate factors, travel numbers, environmental and socio-economic factors) of the incidence of DF and develop early warning system;

• To determine the current impact of climate variables on the transmission of DF in China and Australia;

• To estimate the impact of future climate change on the transmission of DF and the associated disease burden.
Research Plan

Stage I: Data collection (January - December 2016)
- Data collection
  - DF disease data (monthly/weekly incidence measures)
  - Weather data (daily/weekly/monthly)
  - Social-economic factors
- Other data collection
  - Remote sensing data for vegetation
  - Mosquito density (high risk areas)

Stage II: Establishment of the baseline (January – December 2017)
- Developing prediction model
  - Identify geographical location of epidemic areas (governmental and bioclimatic regions)
  - Quantify the link between socio-ecological factors and disease outbreaks using hierarchical Bayesian spatial CAR models
  - Construct mathematical models (initially ODE’s; then stochastic versions)
- Model validation
  - Receiver Operating Characteristic
  - Internal and external cross-validation

Stage III: Projections (January – August 2018)
- Projection
  - Population and climate-driven
  - Intervention optimisation
  - Estimated burden of disease
- Response
  - Health education, mosquito control
  - Disease surveillance
  - Monitor environmental health
  - Public health information and education

Stage IV: Response (September – December 2018)
Thank you for your attention!