Project title:
Mining big data for early detection and mapping of zoonoses driven by climate change and other factors

Project leader: Prof. dr. P.Martens

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Proposal (250 words):

Introduction: A range of factors is responsible for the (re-)emergence of infectious disease threats, including a changing global environment. These include drivers such as climate change and associated environmental impacts, population growth, unplanned urbanisation as well as animal husbandry and trade. A wealth of information is available trhoug various resoucres, although a systematic analysis is lacking. The use of next generation sequencing combined with surveillance data, health registries and societal data from informal/non-traditional sources (e.g. social media) holds promise for improving individual and population health. Current advanced IT technologies offer the opportunity to integrate such big data sets and could enable the rapid and personalised treatment of infected patients/animals, tracking and control of infectious disease outbreaks.

Hypothesis and Objectives:
To identify opportunities to enhance health data base management for effective surveillance and monitoring and to promote efficient policy-making system in China
- To understand the intrinsic and extrinsic global environmental change factors influencing the spread of zoonose driven by e.g. animal trade, biodiversity loss and climate change
- To develop integrated database that builds on the existing data sets related to population and animal health through application of 'big data' techniques
- To comparatively analyze the human and animal health parameters and environment-related indicators in the rural and urban regions in China.

Setting and Methods:
A 'One Health approach', coupled with linking data from a wide range of relevant sources depending on the infectious disease threat. These may include human (e.g. community, hospital or laboratory health services) and animal health surveillance, health registries, microbial and viral genomic data (including next generation sequencing), pathogen resistance data, mapping of vectors, climate and environmental data.

Impact:
Contribution to achieving Sustainable Development Goal, and strengthening capacity for early warning and response to health risks, especially zoonoses in China.

Requirements candidate: Highly motivated student with good English communication skills and proactive and resolute attitude.

Keywords: big-data; zoonoses; One Health

Top 5 selected publications:

1. Oosterbroek, B., De Kraker, J., Huynen, M. & Martens, P. (2016). Assessing ecosystem impacts on health: A tool review. *Ecosystem Services*, 17 (237-254).
2. McIntyre, K.M., Setzkorn, C., Baylis, M., Waret-Szkuta, A., Caminade, C., Morese, A.P., Akin, S., Huynen, M., Martens, P., & Mornad, S. (2010). Impact of climate change on human and animal health. *The Veterinary Record*, 167, 586.

3. Caminade, C., Kovats, S., Rocklov, J., Tompkins, A.M., Morse, A.P., Colón-González, F.J., Stenlund, H., Martens, P., and Lloyd, S.J. (2014). Impact of climate change on global malaria distribution. *PNAS*, doi: 10.1073/pnas.1302089111.

4. Hu, W., Qiu, H., Huang, J., & Dumontier, M. (2017). BioSearch: a semantic search engine for Bio2RDF. *Database-The Journal of Biological Databases and Curation*, 1-13. DOI: 10.1093/database/bax059

5. McMurry, J. A., Juty, N., Blomberg, N., Burdett, T., Conlin, T., Conte, N., ... Parkinson, H. (2017). Identifiers for the 21st century: How to design, provision, and reuse persistent identifiers to maximize utility and impact of life science data. *PLoS Biology* , *15*(6), [e2001414]. DOI: 10.1371/journal.pbio.2001414