PhD studentship (Full-time)

Institution	Xi'an Jiaotong-Liverpool University, China
School	Academy of Pharmacy
Supervisors	Principal supervisor: Dr Ying Chen (XJTLU) Co-supervisor: Dr Li Li (XJTLU) Co-supervisor: Dr Peng Zhao (XJTLU) Co-supervisor: Dr Sarah Clement (UoL)
Application Deadline	Open until the position is filled
Funding Availability	Funded PhD project (world-wide students)
Project Title	Linking biodiversity with human health to inform the One Health Approach: statistical modeling of comprehensive open-access environmental and health datasets on the globe scale
Contact	Please email Ying.Chen01@xjtlu.edu.cn (XJTLU principal supervisor's email address) with a subject line of the PhD project title. The principal supervisor's profile is linked here: Ying Chen｜教职员工｜西交利物浦大学 (XJTLU)

Requirements:

The candidate should have a first class honours degree, or a master's degree (or equivalent qualification), in public health, ecology, environmental science, epidemiology, biostatistics, statistics, information technology, bioinformatics, applied mathematics, and other relevant subjects.

Evidence of good spoken and written English is essential. The candidate should have an IELTS score of 6.5 or above, if the first language is not English. This position is open to all qualified candidates irrespective of nationality.

Degree:

The student will be awarded a PhD degree from the University of Liverpool (UK) upon successful completion of the program.

Funding:

The PhD studentship is available for three years subject to satisfactory progress by the student. The award covers tuition fees for three years (currently equivalent to RMB 80,000 per annum). It also provides up to RMB 16,500 to allow participation at international conferences during the period of the award. The scholarship holder is expected to carry out the major part of his or her research at XJTLU in Suzhou, China. However, he or she is eligible for a research study visit to the University of Liverpool up to six months, if this is required by the project.

Project Description:

Abstract

Biodiversity refers to the variety of life on earth at all its levels, from genes to ecosystems, a key part of the nature system. Although the knowledge in the roles of nature in human society is rapidly growing, research into how biodiversity relates to human health is limited in many aspects. The WHO proposes the "One Health" approach. It is to use collaborative transdisciplinary approach at the regional, national and global levels to achieve optimal health outcomes recognizing the interconnection between people, animals, plants, and their shared environment. In this background, our transdisciplinary team propose a study, using a comprehensive global biodiversity database and databases of health information, to explore pathways linking biodiversity with human health, with consideration of other social-economic factors. The findings derived from this study would be instructive for policies designed for biodiversity conservation, environment protection, and population health promotion.

Research background

Biodiversity comprises the diversity, abundance and identify of species, their genes and ecosystems, and underpins ecosystem services that are essential for human [1]. "One Health" has been proposed by the WHO as a transdisciplinary approach to achieve better public health outcomes and enhance the integrity of ecosystems [2]. The "One Health" approach acknowledges that ecosystem services are directly linked to human health [3]. Biodiversity is a valuable public good that healthy ecosystems provide to human societies. However, whereas evidence of the contributions of nature to human health is rapidly building, research into how biodiversity relates to human health remains limited in important respects [4]. In May 2021, China will host the second session of 15th Conference of the Parties of the Convention on Biological Diversity. The new round of global negotiation has set a new 10-year framework for biodiversity management. Under this post-2020 framework, global cover of terrestrial protected area will increase from 17% to 30% [5]. It implies that a variety of human landscapes outside protected areas, including agricultural land, urban and suburban areas, will serve the function to sustain the coexistence of human and wild flora and fauna. Thus, public health professionals and ecologists are striving to understand the impacts of biodiversity on human health and well-being in particular. Currently, however, there is no comprehensive study to synthesize the biodiversity-health patterns. In this study, we propose to illustrate patterns relating biodiversity with human population health at the global or multi-national scale. The findings are likely to product suggestive results to explain the possible mechanisms. Our study aims to provide a baseline knowledge in biodiversity-health relations to inform further research and policy making using the "One Health" approach. It may also helpful to indicate action priorities to realizing a healthy nature-human coexistence under the newly published post-2020 global biodiversity framework.

Study objectives

This study is to explore the pathways linking biodiversity to human health, using the most comprehensive available (open access) environmental datasets compiled by the UN Biodiversity Lab (UNBL) [6], and official datasets on population health published by various countries and regions.

Specific Questions:

1. Carry out a systematic-review (could further be a meta-analysis dependent on the reviewed data) on the topic of biodiversity and human health (physical and mental).

2. Biodiversity is unevenly distributed at both regional and global scales, and is measured according to various parameters and layers (e.g. species richness, mammalian genetic diversity). This study first aims to determine the common patterns (clusters) of biodiversity measured by different parameters and layers at different regions across the planet. These determined patterns will be used in later analyses to assess the collective effects of common biodiversity profiles on human health, in addition to the assessment for the effects from individual biodiversity measurements.

3. Social-ecological systems with higher biodiversity may be more resilient to health risks. This study aims to establish and quantify the association between biodiversity (measured by individual parameter and layer, and by cluster profile) and indicators of population health in a study setting of cross-sectional ecological epidemiology(Phase 1).To explore the change of biodiversity (gain/loss over time) and its impact on population health, longitudinal ecological study will be used (Phase 2).

4. Finally, using pathway analysis based on the collected variables and established associations, this study aims to investigate potential pathways linking biodiversity to human health at a large scale.

Study setting and design

It is a linked database research of environmental epidemiology using the UNBL data (biodiversity data over time around the world, such as NatureMap global habitats, species richness, mammalian genetic diversity, high biodiversity areas, forest fragmentation) and a series of population health information (historical and current) provided by official agencies of each region such as the US Institute for Health Metrics and Evaluation (including database of Global Burden of Diseases), the UK National Office of Statistics, and the Chinese Center of National Population Health Data. Health measures focus on global indicators such as life expectancy, age and cause-specific mortality, and where available on prevalences of major infectious diseases (e.g. acquired immunodeficiency syndrome) and chronic conditions such as cardiovascular, respiratory, neurological, mental diseases and neoplasms. Regions, as the study samples, are measured at country or smaller levels dependent on the geographical size and scale of health information reported in relevant countries. UNBL is publicly accessible at https://unbiodiversitylab.org.

Statistical approach:

For Specific Question 1, standard systematic-review (and meta-analysis) approaches will be used.

For Specific Question 2, latent class analysis (LCA) will be used to determine the common regional profiles of biodiversity (measured by various parameters and layers). The LCA will cluster study regions into distinct groups based on their profiles of biodiversity measured by parameters and layers, with each region allocated to one cluster [7]. We will use L-square statistics with bootstrap p values, Bayes Information Criterion, and Consistent Akaike's Information Criterion to determine the optimal model, i.e. the optimal number of clusters. Latent GOLD® will be used to perform the analyses, using both the estimation-maximisation

and Newton-Raphson algorithms to estimate model parameters. Regions will be allocated to clusters based on their posterior probabilities of belonging to each cluster. A mean posterior probability ≥0.7 for provinces allocated to a cluster is considered high [7].

For Specific Question 3 at Phase 1, pattern of regional biodiversity (individual level of biodiversity measurement and LCA derived profile) will be included, as an exposure variable, in multivariate regression analyses (ordinary modeling and multilevel modeling [8]) to assess the proposed questions, where health measures (e.g. life expectancy) are used as the outcome variables. Covariates, such as population demographics (e.g. age, gender), information on social-economic development (e.g. GDP per capital, Gini index) and geographical-related data (e.g. temperature, precipitation), will also be included, as exposure variables, in the above analyses for confounding adjustment and factor evaluation.

For Specific Question 3 at Phase 2, statistical analyses will be similar to those applied at Phase 1. However, the exposure and outcome variables will be the changes of biodiversity and health measures over the study period, for example, the forest coverage loss and the increased prevalence of respiratory condition in previous 10 years.

For Specific Question 4, based on the pre-established evidence obtained from Specific Questions 2-3, pathway analysis (structure equation modeling (SEM)) will be used to assess structural relationship between measured and latent exposure variables and outcome variables, with consideration of regional social-economic and geographical influence.

Data presentation:

Traditional tables/figures and novel visualization techniques will be used to assist result presentation and explanation.

Reference

1. CBD. Global Biodiversity Outlook 4, (2006). CBD Montreal.

2. World Health Organization. Connecting global priorities: biodiversity and human health, (2015). World Health Organization and Secretariat of the Convention on Biological Diversity.

3. UNEP. Guidance on integrating biodiversity considerations into One Health approaches. in CBD/SBSTTA/21/9, (2017). Montreal, Canada.

4. Marselle MR, Hartig T, Cox DTC, et al. Pathways linking biodiversity to human health: A conceptual framework. Environment International, (2021) 150:106420.

5. UNEP. First draft of the post-2020 global biodiversity framework. in CBD/WG2020/3/3, (2021) Online.

6. CBD, Launch of UN Biodiversity Lab 2.0: Spatial data and the future of our planet, (2021): New York.

7. Collins LM, Lanza ST. Latent class and latent transition analysis: with applications in the social, behavioural, and health sciences (Wiley Series in Probability and Statistics). Hoboken, New Jersey: Wiley, (2010).

8. Goldstein H. Multilevel statistical models (Wiley series in probability and statistics). Hoboken, New Jersey: Wiley, (2010).

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https://www.xjtlu.edu.cn/en/admissions/global/entry-requirements/

How to Apply:

Interested applicants are advised to email Ying.Chen01@xjtlu.edu.cn (XJTLU principal supervisor's email address) the following documents for initial review and assessment (please put the project title in the subject line).

- Research proposal
- Full academic transcripts of university studies and grading system (both bachelor and master)
- University degree certificate or enrollment statement (both bachelor and master)
- Verification report of degree certificate(Chinese students only, both bachelor and master)
- A copy of Master dissertation (or an equivalent writing sample) and examiners reports available
- Certificates of English language qualifications (IELTS or equivalent)
- Personal statement
- Curriculum Vitae
- Two formal reference letters
- A copy of your passport (for international students only)