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Land Use Change, Transmission Potential Networks and Disease Spread in Madagascar

Project Number	Contact PI/Project Leader	Awardee Organization
5R01TW011493-02	NUNN, CHARLES	DUKE UNIVERSITY

Description

Abstract Text

Anthropogenic land use alters ecological communities, leading to the question: How do these changes alter **infectious disease** transmission, including to humans? This question is especially important in low-income countries such as Madagascar, where zoonotic diseases remain major threats to public health. The proposed research aims to model the ecological and socioeconomic factors that influence **disease** spread and predict how **infectious** agents spread from small mammals and domesticated animals to people. This goal will be pursued through innovative and interdisciplinary field, laboratory, and analytical approaches. The team of ecologists, social scientists, and a mathematician will integrate and model ecological and socioeconomic data from the field site in rural Madagascar, which includes a protected area surrounded by native forest fragments, agricultural fields, and villages of subsistence agriculturalists. Around four villages and in the park, the team will investigate multiple hypotheses concerning how human land use activities shape zoonotic **disease** transmission. To extend the findings globally, the researchers will use the Global Mammal Parasite Database to investigate how human land use and network connectivity impact host-parasite relationships and prevalence. The interdisciplinary team is uniquely positioned to investigate **infectious disease** transmission in this system. By integrating multiple data sources into unified mathematical representations, the team will investigate specific hypotheses for how diseases spread using multilayer transmission potential networks (TPNs). Significantly, they will test how TPNs and **disease** transmission change with human activities and identify the socioeconomic factors that lead some people to be more connected into transmission networks. Specifically, the team will: (i) identify pathways of **disease** transmission using cutting-edge field and analytical methods, coupled with **infectious disease** data representing multiple transmission modes; (ii) investigate socioeconomic characteristics of individual humans that most strongly connect them into TPNs of wildlife and domesticated animals; (iii) characterize how human activities generate entry points of **infectious disease**. Comparative analyses will extend the findings beyond the Malagasy study system. TPNs will be based on trapping data for small mammals, GPS data for people and domesticated animals, and social network surveys for people. The team will test whether these networks predict infection with multiple pathogens, including Leptospira, Yersinia, Babesia, Rickettsia, and gastrointestinal helminths. The research team has all necessary permits, extensive on-the-ground logistical support, and substantial pilot data on human and animal populations at the site.

Public Health Relevance Statement

The proposed research will develop and apply new analytical frameworks to identify the drivers of disease transmission in ecological communities, with the goal of identifying the factors that lead some individuals to be conduits of infectious disease into the human population. Research will take place in Madagascar, where multiple zoonotic diseases continue to impact human health. The novel approaches developed in this research will be applicable to a broad range of settings worldwide.

NIH Spending Category

Thank you for your feedback!

Climate-Related Exposures and Conditions Clinical Research

Emerging Infectious Diseases Infectious Diseases Social Determinants of Health

Vector-Borne Diseases

Project Terms

Agriculture Animals Antibodies Area Astrovirus Babesia Bacteria

Characteristics Communicable Diseases Communities Competence

Coupled Data Databases Dimensions **Disease** **Disease** Pathway

Domestic Animals Education Goals Habitats Health Helminths

Host-Parasite Relations Household Human Human Activities Individual

Infection **Infectious** Agent Laboratories Lead Leptospira Location

Logistics Madagascar Mammals Mathematics Methods Modeling

Molecular Organism Ownership Parasites Pathway interactions Pattern

Read More

Details

Contact PI/ Project Leader

Name
NUNN, CHARLES

Title
PROFESSOR

Contact
clnunn@duke.edu

Other PIs

Not Applicable

Program Official

Name
JESSUP, CHRISTINE

Contact
christine.jessup@nih.gov

Organization

Name
DUKE UNIVERSITY

City
DURHAM

Country
UNITED STATES (US)

Department Type
SOCIAL SCIENCES

Organization Type
SCHOOLS OF ARTS AND SCIENCES

State Code
NC

Congressional District
04

Other Information

FOA
PAR-19-003

Study Section
Special Emphasis Panel[ZRG1-IDM-U(55)R]

Fiscal Year
2020

Award Notice Date
30-April-2020

Administering Institutes or Centers
FOGARTY INTERNATIONAL CENTER

DUNS Number
044387793

CFDA Code
989

Project Start Date
17-July-2019

Project End Date
30-April-2024

Budget Start Date
01-May-2020

Budget End Date
30-April-2021

Project Funding Information for 2020

Total Funding
$497,996

Direct Costs
$438,973

Indirect Costs
$59,023

Year	Funding IC

Thank you for your feedback!

Year	Funding IC	FY Total Cost by IC
2020	FOGARTY INTERNATIONAL CENTER	$497,996

NIH Categorical Spending

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Funding IC	FY Total Cost by IC	NIH Spending Category
FOGARTY INTERNATIONAL CENTER	$497,996	Climate-Related Exposures and Conditions; Clinical Research; Emerging Infectious Diseases; Infectious Diseases; Social Determinants of Health; Vector-Borne Diseases;

Sub Projects

No Sub Projects information available for 5R01TW011493-02

Publications

No Publications available for 5R01TW011493-02

Patents

No Patents information available for 5R01TW011493-02

Outcomes

The Project Outcomes shown here are displayed verbatim as submitted by the Principal Investigator (PI) for this award. Any opinions, findings, and conclusions or recommendations expressed are those of the PI and do not necessarily reflect the views of the National Institutes of Health. NIH has not endorsed the content below.

No Outcomes available for 5R01TW011493-02

Clinical Studies

No Clinical Studies information available for 5R01TW011493-02

News and More

Related News Releases

No news release information available for 5R01TW011493-02

History

No Historical information available for 5R01TW011493

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Similar Projects

No Similar Projects information available for 5R01TW011493-02

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