

Opportunity Title: Environmental Triggers for Disease Outbreaks

Opportunity Reference Code: ICPD-2019-12

Organization Office of the Director of National Intelligence

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How to Apply **Create and release your Profile on Zintellect** – Postdoctoral applicants must create an account and complete a profile in the on-line application system. **Please note: your resume/CV may not exceed 2 pages.**

Complete your application – Enter the rest of the information required for the IC Postdoc Program Research Opportunity. The application itself contains detailed instructions for each one of these components: availability, citizenship, transcripts, dissertation abstract, publication and presentation plan, and information about your Research Advisor co-applicant.

Additional information about the IC Postdoctoral Research Fellowship Program is available on the program website located at:
<https://orise.orau.gov/icpostdoc/index.html>.

If you have questions, send an email to ICPostdoc@orau.org. Please include the reference code for this opportunity in your email.

Application Deadline 3/1/2019 6:00:00 PM Eastern Time Zone

Description **Research Topic Description, including Problem Statement:**

- The goal of this research is to advance the state of the art in plant, animal, and human disease forecasting by identifying areas where diseases may reemerge. This can lead to better surveillance and allow organizations to preposition resources to deal with new outbreaks. Many diseases correlate to environmental variables due to host vectors or changes in their ecological niche. We need to be able to build models that can work across different ecosystems (e.g. arid vs. humid, coastal vs. mountainous) and routes of transmission from environmental sources (e.g. zoonotic, vector-borne). A framework that can convey the increased risk from multiple diseases due to environmental changes will allow policy makers, health care providers, farmers, and other stakeholders to make timely decisions and reduce the impact of future disease outbreaks.

Example Approaches:

- There are a number of diseases that have demonstrated environmental controls which can trigger outbreaks or reduce disease prevalence (e.g. bluetongue virus, dengue fever, schistosomiasis, wheat fungus) [1-6]. The research could focus on one of three major areas: 1) crop, 2) livestock, and 3) human diseases. While the proposal can focus on a single disease in one focus area, the methods should be applicable globally and transferrable to additional diseases. The targeted disease(s) can be endemic to a region; however, the approach should be able to distinguish elevated risks caused by changing environmental factors. Proposals that incorporate interdisciplinary methodology and data are encouraged. For example, models could include factors such as access to water sanitation to help constrain non-environmental factors that increase outbreak risk. While environmental niche models may also be useful in constraining the proposed model, these model(s) should be responsive to changing conditions and utilize spatial temporal data. The solution should not focus on epidemiological modeling, although that may be a minor component to demonstrate how early forecasting of outbreaks can help prioritize resource allocation.

Relevance to the Intelligence Community:

- Disease outbreaks risk straining limited health care networks in countries with poor infrastructure and can heighten food security risk if diseases influence the food supply. As was seen in both West African Ebola and the South American Zika outbreaks, some nation-states were unprepared to deal with the influx of their populace into their health care system. Likewise, avian and swine flu outbreaks led to mass culling of livestock, reducing protein sources and income in developing nations. Thus, models that can predict reemergence of disease or identify similar environmental conditions can help flag potential national security issues prior to their occurrence. The USGOV could also proactively conduct surveillance or place resources ahead of time for improved response times in the event of a crisis.

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References:

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- [3] Herfindal, I., Lande, U. S., Solberg, E. J., Rolandsen, C. M., Roer, O., & Wam, H. K. (2017). Weather affects temporal niche partitioning between moose and livestock. *Wildlife Biology*, wlb-00275.
- [4] Manogaran, G., & Lopez, D. (2018). Disease surveillance system for big climate data processing and dengue transmission. In *Climate Change and Environmental Concerns: Breakthroughs in Research and Practice* (pp. 427-446). IGI Global.
- [5] Orozco-Fuentes, S., Griffiths, G., Holmes, M. J., Ettelaie, R., Smith, J., Baggaley, A. W., & Parker, N. G. (2018). Early warning signals in plant disease outbreaks. *arXiv preprint*, 1802.07562.
- [6] Zhang, L., Yang, B., Li, S., & Guo, A. (2017). Disease–weather relationships for wheat powdery mildew under climate change in China. *The Journal of Agricultural Science*, 155(8), 1239-1252.

Key Words: Early Warning Models, Forecasting, Disease, Remote Sensing, Climate, Food and Water Security, Ecology

Qualifications

Postdoc Eligibility

- U.S. citizens only
- Ph.D. in a relevant field must be completed before beginning the appointment and within five years of the application deadline
- Proposal must be associated with an accredited U.S. university, college, or U.S. government laboratory
- Eligible candidates may only receive one award from the IC Postdoctoral Research Fellowship Program.

Research Advisor Eligibility

- Must be an employee of an accredited U.S. university, college or U.S. government laboratory
- Are not required to be U.S. citizens

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
 - **Communications and Graphics Design** (6 )
 - **Computer Sciences** (17 )
 - **Earth and Geosciences** (23 )
 - **Engineering** (27 )
 - **Environmental and Marine Sciences** (13 )
 - **Life Health and Medical Sciences** (47 )
 - **Mathematics and Statistics** (11 )
 - **Nanotechnology** (1 )
 - **Other Physical Sciences** (12 )
 - **Physics** (16 )
 - **Social and Behavioral Sciences** (36 )