REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**

1. REPORT DATE *(DD-MM-YYYY)*
21-09-2022

2. REPORT TYPE
Briefing Slides

3. DATES COVERED *(From - To)*

4. TITLE AND SUBTITLE

Predicting the Risk of Novel Pathogen Introductions from Disease Surveillance Data

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

6. AUTHOR(S)
Nelson Walker, PhD: 812th TSS/ENTR, 815-656-1116;
Trevor Hefley, PhD: Kansas State University Department of Statistics, 785-532-6883;
Daniel Walsh, PhD: U.S. Geological Survey, 608-270-2481;
Ian McGahan, PhD: University of Wisconsin Department of Statistics
Daniel Skinner: Illinois Department of Natural Resources, 217-782-6302;
Daniel Storm: Wisconsin Department of Natural Resources, 715-336-5035;

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AND ADDRESS(ES)
812th Test Wing
195 E Popson Ave
Edwards AFB CA 93524

8. PERFORMING ORGANIZATION REPORT NUMBER
412TW-PA-22293

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
412th Test Wing
195 E Popson Ave
Edwards AFB CA 93524

10. SPONSOR/MONITOR'S ACRONYM(S)
N/A

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release Distribution Statement A: distribution is unlimited.

13. SUPPLEMENTARY NOTES
Source Code 012100 (This number comes from STINFO via EAFB Technical Library)
CA: 412th Test Wing, Edwards AFB, CA

14. ABSTRACT

In the course of an infectious disease outbreak, researchers often must estimate or infer the source of the causative pathogen, the risk factors associated the spread and growth of the pathogen, and risk factors that may be associated with new outbreaks. Because the exact time and location of introduction for the pathogen is usually unobserved, these questions must be addressed using incomplete or indirect data, such as spatio-temporal disease surveillance data. We introduce a Bayesian hierarchical mixture model for spatio-temporal, binary disease surveillance data that accounts for the dynamic process of the pathogen diffusing and multiplying through a population from multiple sources. Our framework provides approximate posterior estimates for the number, locations, and times of introduction of the pathogen in a population, as well posterior inference on parameters associated with pathogen growth and diffusion. We also obtain posterior inference on the generative spatial process that produced the pathogen introductions. We demonstrate this framework using disease surveillance data for chronic wasting disease in white tailed deer from Wisconsin and Illinois in the United States.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
Unclassified			None	33	412 TENG/EN (Tech Pubs)
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. TELEPHONE NUMBER** *(include area code)*
Unclassified	Unclassified	Unclassified			661-277-8615