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## **OPERATIONAL EPIDEMIOLOGY: AN OUTBREAK INVESTIGATION APPROACH TO F-22 PHYSIOLOGIC INCIDENTS**

*French: ÉPIDÉMIOLOGIE OPÉRATIONNELLE: UNE APPROCHE D'INVESTIGATION FIDÈLE DES INCIDENTS PHYSIOLOGIQUES F-22*

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**Introduction:** From 2008-2012, multiple U.S. Air Force F-22 pilots reported physiologic incidents with no known cause. A team at the 711th Human Performance Wing assisted in the investigation, utilizing an outbreak investigation approach to help identify the root causes of the incidents. This presentation will review the basic steps of an outbreak investigation, explain how each step was applied to the F-22 investigation, and propose a modified approach for use in future scenarios.

**Background:** Outbreak investigations are typically described as having 10 steps: 1. Prepare to investigate; 2. Verify the diagnosis and confirm the existence of an outbreak; 3. Create a case definition; 4. Identify cases; 5. Perform descriptive epidemiology; 6. Develop hypotheses; 7. Evaluate hypotheses through statistics; 8. Refine hypotheses; conduct additional studies; 9. Implement control/prevention measures; and 10. Communicate findings. In general, the traditional outbreak investigation approach provided a good framework for the F-22 investigation--epidemiologic statistics such as case-control studies were valuable tools for the investigation, and descriptive epidemiology played a key role. However, not all steps directly applied to the F-22 scenario. While most classical epidemiology is based on infectious disease models, the F-22 incidents had an unknown diagnosis as well as an unknown origin. Because both the cause and the effect were unknown, several modifications to the traditional approach were necessary. For instance, it is not possible to verify a diagnosis for an unknown outcome. Similarly, case definitions must be fluid, which makes quantifying the outbreak difficult.

**Summary:** The traditional outbreak investigation approach provided a template to investigate a novel problem. However, the need to describe an unknown outcome was not fully met by the outbreak investigation approach, nor was the need to mitigate operational risk where possible. The authors propose modifications to the traditional approach that may be more relevant to operational settings and/or to outbreaks with novel, unknown outcomes.