EPSTEIN INSTITUTE SEMINAR ▪ ISE 651

Engineering Modeling to Assist in Eradication of Guinea Worm

ABSTRACT – Dracunculus medinensis, more commonly referred to as Guinea worm (GW), is a parasitic nematode. The campaign to eradicate GW infections in humans has made much progress since 1985 when the number of annual human infections in 20 countries was estimated to be 3.5 million. However, 10 cases of GW were detected in Chad in 2010, 10 years after the end of the national eradication campaign. Evidence so far indicates that although there are no human cases, transmission of the parasite continued, leading to infections in domestic dogs. Indeed, since 2012 surveillance of GW infections in hundreds of villages have reported Guinea worms emerging from dogs and cats in Chad and from dogs, cats, and baboons in Ethiopia. GW Surveillance in Chad from 2012 onward has shown a significant increase in dog infections, reaching a peak of just over one thousand dogs infected in 2016. While the number of human infections dwindled as a result of the eradication campaign, the large number of dog infections risks perpetuating transmission among animals in currently endemic countries and of water-borne outbreaks involving tens if not hundreds of human infections.

How can engineering help in eradicating Guinea Worm? This presentation will describe a collaboration with The Carter Center, where we develop a simulation to capture the dynamics of the GW transmission and spread focusing on dogs as the mammal host. The model considers various factors such as the GW life cycle, potential environmental-related factors, and the impact of existing intervention strategies. One goal of the model is to determine whether a new paratenic host animal such as fish, frogs, or lizards is being incorporated into the lifecycle of GW. A second goal is to understand what interventions will be most effective towards eradication.

This work is joint with collaborators from Georgia Tech (PhD student Tyler Perini and Faculty Natashia Boland and Pinar Keskinocak) and The Carter Center (Ernesto Ruiz-Tiben and others).

Dr. Julie L. Swann
Professor and Department Head
Department of Industrial &
Systems Engineering
North Carolina State University

SPEAKER BIO – Julie Swann is the Department Head and A. Doug Allison Distinguished Professor of the Fitts Department of Industrial and Systems Engineering. She is an Adjunct Professor in the Joint Department of Biomedical Engineering at the University of North Carolina at Chapel Hill. Prior to joining NC State, she was the Harold R. and Mary Anne Nash Professor in the Stewart School of Industrial and Systems Engineering at the Georgia Institute of Technology, where she co-founded and co-directed the Center for Health and Humanitarian Systems, one of the first interdisciplinary research centers on the Georgia Tech campus. In 2009, she was on loan as a science advisor for the H1N1 pandemic response at the Centers for Disease Control and Prevention.

Dr. Swann is a research leader in using mathematical modeling to enable supply chain systems and health care to become more efficient, effective, or equitable. Recent collaborations have been to use data analytics and systems optimization to quantify the return on public investments to improve pediatric asthma, plan for infectious disease outbreaks, and design systems with decentralized decision makers. She has impacted many organizations such as AT&T, Centers for Disease Control and Prevention, Children's Healthcare of Atlanta, Clorox, General Motors, Habitat for Humanity, Honda, NCR, Southern Company, The Coca-Cola Company, The Home Depot, UPS, the Veterans' Administration, and Walmart.

USC Viterbi
School of Engineering
Daniel J. Epstein Department of Industrial and Systems Engineering

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3:30PM – 4:50PM
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