FACULTY SEMINAR

HEALTH SCIENCE CENTER, KUWAIT UNIVERSITY

THE AGE OF EVOLUTIONARY EPIDEMIOLOGY: HOW PHYLODYNAMIC MODELS ARE CHANGING THE LANDSCAPE OF INFECTIOUS DISEASES EPIDEMIOLOGY

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Abstract: During the last two decades, the rapid growth of pathogens' genetic data and computational resources increased the applications of phylodynamic methods in animal and human disease surveillance. Using a single Bayesian statistical framework, these methods can account for uncertainties and uniquely integrate complex epidemiological and evolutionary processes in populations. Therefore, this innovative quantitative integration improved disease investigation by untangling novel epidemiological questions about the evolutionary history, spatiotemporal origins, within and between-host transmission, and environmental risk factors for rapidly evolving pathogens. These approaches will provide a robust platform for guiding the allocation of resources within a surveillance system, for example, targeting emerging strains with higher evolutionary rates or hosts at high risk of generating new strains, which subsequently will reduce the economic costs of sampling, control, and prevention activities. One major advantage of Phylodynamic methods is that they are implemented in many open-source, user-friendly statistical software packages. In this take, we will demonstrate basic principles for building a phylodynamic analytical pipeline and highlight the prospects of the methods in improving infectious disease surveillance and clinical.

Short bio: Dr Mohammad A. Alkhamis is an assistant professor at the Department of Epidemiology and Biostatistics, Faculty of Public Health, Kuwait University. He is a quantitative epidemiologist, and his scientific expertise includes statistical learning, Bayesian statistics, big data, health, and applications of advanced epidemiological methods in disease surveillance, control, and prevention. His current research interests include tracing the origins and dispersal of infectious pathogens using Bayesian phylodynamic methods and applications of machine-learning methods in infectious disease prediction and mapping. He has over 45 peer-reviewed publications on disease surveillance and has collaborated with national and international organizations (WOAH, FAO, USDA, DHS, NPB) on projects related to the applications of advanced surveillance methods on transboundary infectious diseases. He also served 5 years as an adjunct assistant professor at the University of Minnesota Twin Cities.

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