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Demand Forecasting for Ebola Outbreak Responses

Motivation

Ebola and other emerging infectious disease outbreaks are increasing in frequency and intensity due to urbanization and population mobility.

My work experience has provided substantial on-the-ground insight into the supply-chain and operational challenges of managing outbreak response operations:

- 2014/15: West Africa outbreak (Liberia and Sierra Leone)
- 2017/18: Uganda outbreak response preparedness; and
- 2018/Ongoing: North Kivu, DRC assessment & analysis.

Graduating from the top Supply-Chain Masters program in the world will provide the academic credibility to effectively advocate for improved policy and planning for future efforts.

The Problem

Expeditionary Logistics: Ebola Outbreak responses rely on an international supply-chain with last-mile delivery in austere and remote settings.



Failure is Not an Option: Stock-outs of critical supplies will likely cost lives, increase suffering, or risk staff safety creating an extreme penalty for fulfillment failure.

Changing Environments and Responses: Conflict zones, rural, and urban responses have different dynamics that challenge the demands of the response team while new tools and tactics are being validated and tested.

Can Humans Adapt Faster than Emerging Infectious Diseases?



A caregiver comforting an infected baby in the quarantined area of the Ebola triage and treatment center run by Doctors Without Borders in Beni, DRC. *Photo Credit: Diana Zeyneb Alhindawi for The New York Times*

Key Question

How can we employ supply-chain management methodology to enhance the capability and capacity of response planners to analyze and comprehend the demands of expeditionary outbreak responses?

Methodology

- ❑ Firsthand experience with outbreak response operations in four countries over five years with three different organizations by a SCM subject matter expert.
- ❑ SCM flow diagramming to demonstrate the network dynamics between response pillars in relation to epidemiology and case management flow.
- ❑ Application of demand forecasting tools to support case management (treatment), infection prevention control in health facilities, and vaccination campaigns.

Initial Results



An Ebola suspected case was admitted in Fort Portal, Uganda. In-patient services were provided for a period of 3 weeks under the clinical protocol for viral hemorrhagic fevers. The consumption rates prove inventory levels set for planned strategies following West Africa outbreak **understocked planned interventional efforts**.



2014-2018 Bed Ratio: Port Loko vs. Current

While working on-site during the 2018 North Kivu, DRC Ebola Outbreak research conducted demonstrates the stark contrast between the 2014 response and current efforts. Vaccinations and improved lab testing resulted in a 86% reduction in bed capacity without any admittance refusals.

Expected Contribution

Provide an academic contribution that uses SCM methodology to enhance outbreak response analysis and comprehension for improved policy and planning.

- Introduction to Ebola response operations for non-clinical staff
- Flow diagramming of Ebola response dynamics and impact on operations
- Comparison of 2014 & 2018 outbreaks
- Basic demand forecasting guidelines for:
 - Case management
 - Infection prevention control
 - Vaccination campaigns



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