A Tale of Two Pandemics: Applying Lessons from Ebola to Drive Innovation for Zika

### The Pandemic Problem

- Emerging infectious disease outbreaks pose a significant health and socioeconomic threat.
  - Severe Acute Respiratory Syndrome (SARS) – 2002
    - 8000+ cases reported in 37 countries
    - 730+ deaths prior to containment
    - $40+ billion in losses worldwide
    - No vaccine is currently available for future outbreaks
  - Middle East Respiratory Syndrome (MERS) – 2012
    - 1000+ cases reported in 24 countries
    - 2+ billion in losses during 2015 South Korea outbreak
    - No vaccine is currently available for future outbreaks
  - Influenza A (H1N1) Virus – 2009
    - 250,000+ deaths prior to containment
  - SARS – 2002
    - 700+ deaths prior to containment
  - Ebola Virus – 2014
    - 28,000+ cases reported in 10 countries
    - 19,000+ deaths prior to containment
    - $30+ billion in losses worldwide
    - No vaccine is currently available for future outbreaks
  - Zika Virus – 2015
    - 8000+ cases reported in 30+ countries
    - Possible link to microcephaly
    - No vaccine is currently available for future outbreaks

### Mapping R&D Alliances

#### Figure 2: Ebola Vaccine Development

- Phase I
- Phase II (Concluded)
- Phase II
- Phase II & II
- Phase III
- rVSV-EBOV – Phase III Clinical Trials
- ChAd3-ZEBOV – Phase III Clinical Trials
- WHO declares a PHEIC August 2014
- BCX4430 – Phase I Clinical Trials
- rVSV-EBOV – Phase III Clinical Trials
- ChAd3-ZEBOV – Phase III Clinical Trials
- WHO declares a PHEIC August 2014
- BCX4430 – Phase I Clinical Trials
- Inovio Pharmaceuticals
- Johnson & Johnson
- Geovax
- Takeda
- Sementis Ltd
- Sanofi
- Pfizer
- Innovio Pharmaceuticals
- Interexon
- Ad26-EBOV – Phase III Clinical Trials
- MVA-EBOV – Phase III Clinical Trials

#### Figure 3: Zika Vaccine Development

- Phase I
- Phase II
- Phase III
- BCX4430 – Phase I Clinical Trials
- Innovio Pharmaceuticals
- Interexon
- Ad26-EBOV – Phase III Clinical Trials
- MVA-EBOV – Phase III Clinical Trials
- WHO declares a PHEIC August 2014
- BCX4430 – Phase I Clinical Trials
- Inovio Pharmaceuticals
- Interexon
- Ad26-EBOV – Phase III Clinical Trials
- MVA-EBOV – Phase III Clinical Trials

### Stakeholder Analysis

- Public health imperative drove rapid response of key players
- Cost of drug development inhibits sustainable investment
- Public-Private Partnerships (PPPs) are a model for risk-sharing and innovation
- Incentives must be tailored to meet unique partner profiles
- Pandemic response must be proactive and not reactive

### Research Strategy

**Challenges:**
- What motivates players to invest in infectious diseases?

**Methodology:**
- Interviewed stakeholders from the public, private, and non-profit sectors
- Analyzed partnership formation following the Ebola and Zika outbreaks

### Project Summary

With the significant international consequences of recent outbreaks, the ITP Lab conducted extensive stakeholder interviews and macro-level health policy analysis to expose gaps in pandemic preparedness and develop legal frameworks for future threats.