

Pandemic Simulation (PanSim)

Planning for Preparedness and Response

According to a report on pandemic influenza preparedness and response by the World Health Organization (WHO) dated April 7, 2005, “the world [is] closer to an influenza pandemic than at any time since 1968.” The H5N1 strain of Influenzavirus A, a highly pathogenic form of avian influenza, is causing the current risk. “Events affecting both human and animal health...have given the world an unprecedented warning that a pandemic may be imminent.” Without intervention, a potential pandemic is expected to cause an outcome similar to the 1918 Spanish Flu, with an estimated death toll of 2 to 4 percent of the entire population.

The WHO insists the ubiquitous warning signs associated with these cases have “opened an unprecedented opportunity to enhance preparedness,” which we must act on. With almost a century of progress in healthcare and technology, the federal government, healthcare system, and industry are expected to design and implement effective plans for each of the three pillars of the National Strategy for Pandemic Influenza—preparedness, surveillance, and response—to sharply reduce the potential impact of an outbreak.

The Strategic Simulation

On March 27–28, 2006, the Center for Health Transformation and Booz Allen Hamilton engaged nearly 100 leaders from around the world in a simulated influenza pandemic to analyze federal, state, local, healthcare, and industry response plans in the face of a pandemic. Participants discovered the majority of response actions they took had only a minor impact on the final outcome. The prolonged surge of a severely ill population quickly overwhelmed the healthcare system, and industry was forced to cope with a large percentage of the workforce out sick or absent for an extended period of time. Severe food shortages and feelings of isolation caused civil unrest among a population already overwhelmed by emotional distress as a result of being surrounded by fatal illness and death.

Participants concluded that proper preparedness requires actionable response plans and trained people able to quickly carry those plans out. However, it also requires an understanding of how the general population will respond to a pandemic. In fact, participants found that human impact on the final outcome is at least as important if not more important than impact of the virus itself. Hence, a preparedness and response plan can only be as realistic as the degree to which the plan accounts for the “human factor.”

The PanSim Model

To immerse the simulation’s participants in a realistic pandemic scenario, Booz Allen developed an innovative model to estimate disease progression and impact. PanSim is based on two main factors: virus spread and human behavior. The virus spread model uses census data (population density, travel patterns, and transportation networks) and virus characteristics (infection, recovery, and death rates) to estimate how the disease might spread throughout the country. The human behavior model uses socioeconomic networks to compute resource depletion, industry capacity, and workforce availability, as well as social factors to estimate anxiety, unrest, trust, policy adherence, and absenteeism.

In PanSim, the virus spread model and the human behavior model are tightly coupled to capture how human behavior affects virus spread through travel pattern changes and how virus spread affects human behavior through social response. Policies, such as social distancing, resource rationing, healthcare measures, industry realignment, and communication, can also be introduced into the model. The efficacy of each policy depends on the disease and socioeconomic status at the time of the policy’s introduction.

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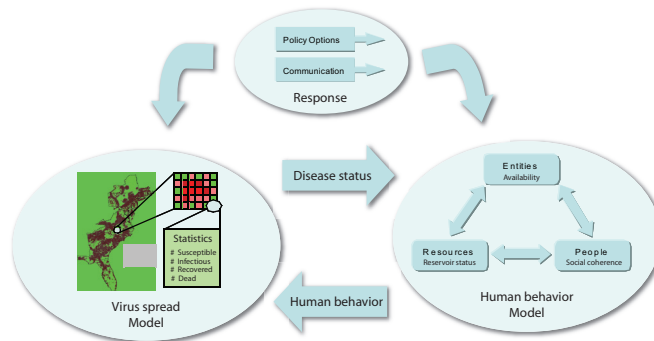
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Multi-Intelligence Analysis Process

Exhibit 1
Pandemic Strategic Simulation

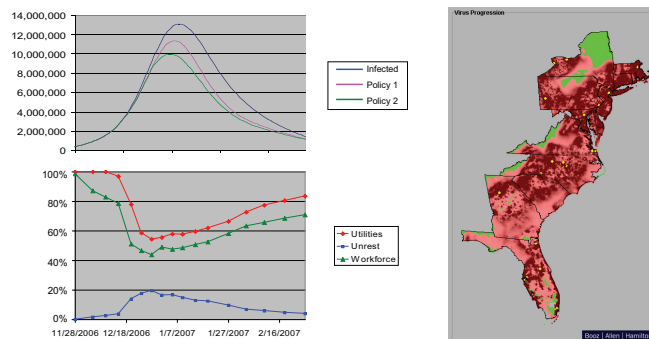


Results

PanSim immerses its users in a simulated pandemic so they can test and train their responses under realistic conditions to enhance and optimize preparedness. Users may represent a cross-section of key elements of society as a whole or a cross-section of specific societal subgroups, such as governmental departments, military divisions, hospitals, pharmaceutical companies, or other public or private entities.

When used to support a strategic simulation with player teams, the simulation setup is suited to optimally capture the human factor—which is otherwise difficult to estimate—through use of the human behavior model and observation of the actual behavior of the individual teams. In this way, the simulation setup allows us to explore and validate response plans in a realistic scenario. PanSim provides detailed graphical feedback of all aspects of the pandemic on a daily basis, and it shows the impact of policies applied throughout the strategic simulation.

Exhibit 2
PanSim Feedback



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