CVMDM: Community Vaccination and Mass Dispensing Model

What is CVMDM?

Argonne's Community Vaccination and Mass Dispensing Model (CVMDM) simulates the allocation and distribution of pharmaceutical materials across a jurisdiction and the dispensing of those materials through points of dispensing (PODs). Given a request time for initial supplies from the Center for Disease and Prevention Control's Strategic National Stockpile, estimated resupply intervals, population size and age distribution, and POD personnel resources, the model calculates the estimated start time for public vaccinations, POD queue times and throughput, and operation closure. Linked with a disease progression submodel, CVMDM tracks and reports the number of infections and fatalities based on disease characteristics and the performance of prophylaxis supply logistics and PODs.

CVMDM can be run with any underlying disease characteristics, but its standard configuration is configured for use in planning for a pandemic influenza outbreak. Because the specific disease characteristics are still unknown, the user can select from several alternative disease characteristics that are based on historic pandemics. The user can also change the disease parameters to customize the model for other infectious diseases.

Model Framework

The model framework is consistent with the National Incident Management System and Incident Command System (NIMS/ICS) standards. It enables jurisdictions to engage in preparedness planning while fulfilling the NIMS resource management advanced planning principle. Further, this model can be used to update projections for the planning section and incident commander during a public health emergency.

Testing to Refine Model

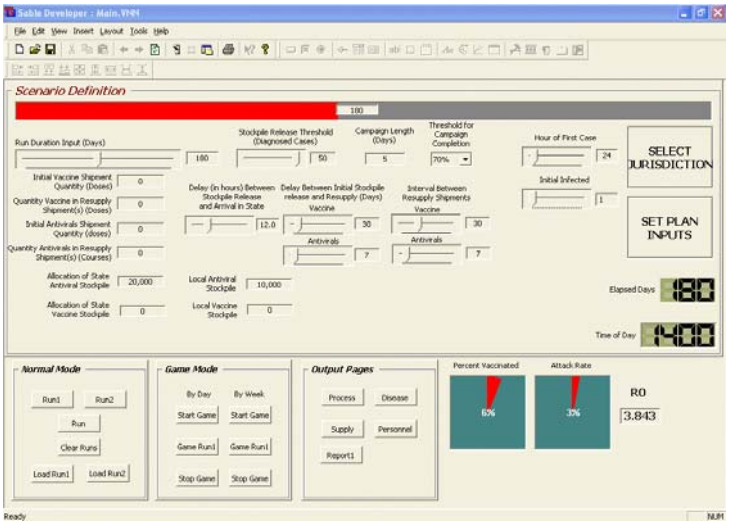
To ensure this model properly reflects the preparedness needs of public health departments, Argonne has worked closely with city, county, and state public health officials in Illinois to develop and refine the model. Argonne staff evaluated exercises, conducted field visits, and incorporated public health officials' critiques and feedback. As a result, the model accurately captures the prophylaxis planning needs of public health departments.

Scope

All 50 states and many localities have established plans for dealing with a pandemic influenza, and other health emergencies. Many of these plans set targets for mass prophylaxis that may need to be further tested based on logistics and personnel resources available to the health authorities. There will be many challenges to achieving a sufficiently high POD throughput levels that will slow or stop the spread of a disease via pharmaceutical interventions.

Who will benefit from using CVMDM?

Argonne's Community Vaccination and Mass Dispensing Model is a robust tool that will help public health agencies meet their deadlines. It will enable these agencies to simulate, study, and understand alternative resource availability contingencies and allocation schemes. Unique to CVMDM is the internalization of an infectious disease model that links the ultimate measure of success, human health, and welfare directly to measures of campaign efficiency and effectiveness.



Sample Input/Output Screen

The model is specifically designed to help local public health agencies develop, review, and test the details of their mass vaccination and prophylaxis dispensing plans. It is intended for public health emergency planners and key decision makers within the NIMS Incident Command System and those who provide planning support. The model is also designed for use by public health and emergency management officials during the planning, incident management preparedness, and response phases.

Although the model is primarily useful to enhance preparedness and resource management planning, it can also be used in a command and management function to support emergency management decision making. For example, during a public health emergency, the model's outputs can be used to shape and forecast future logistical and operational objectives based on daily progress reports of POD throughput.

What challenges are addressed?

Some of the challenges that CVMDM can help address include:

- *Delays in vaccine stockpile delivery to PODs.* Timely delivery of adequate stockpile resources is critical to reducing illnesses and fatalities. Ensuring efficient and timely delivery and planning for contingencies in the event of delayed deliveries should be a key goal for local and state health authorities.
- *Adequate availability of qualified and trained personnel.* The primary constraint on the number of prophylaxis centers called for in state and local plans will likely be the total number of qualified and trained workers who can meet minimum standard of care statues and who will be available to staff the centers. Understanding the impact of reduced (or supplemental) staff resources is critical to responsible planning.
- *Equitable policies to deal with limited resources.* CVMDM can help explore the effectiveness of alternative policy options to minimize illness and fatality rates, such as prioritization schemes and allocation strategies for limited resources.

Selected Input

- ***Total population***
- ***Stockpile quantity***
- ***Transportation and breakdown times***
- ***Personnel resources***
- ***Number of PODs***

Selected Output

- ***Start time of POD operations***
- ***Hours until campaign completion***
- ***Queue lengths at POD stations***
- ***Number of new infections by hour***
- ***Estimated fatalities by hour***

Learn more about CVMDM and other Argonne-developed models at:
http://www.dis.anl.gov/

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