Research Brief

NCPERRC
North Carolina Preparedness and Emergency Response Research Center

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Utilizing systems engineering models to enhance collaboration and vaccination clinic efficiency

One of the challenges in implementing mass vaccination clinics during the H1N1 pandemic included setting appropriate staffing levels to vaccinate an unknown number of community members on any given day a vaccination clinic was offered. Some other challenges to this type of clinic planning include: determining the most efficient patient flow pattern, minimizing patient time spent filling out forms, and reducing bottlenecks (Aaby, 2006). Computer simulation models are tools that can help planners address some of these challenges (Aaby, 2006). This case study describes a collaborative effort to try to re-create (via computer simulation models) several different types of clinics implemented during the H1N1 pandemic to help health directors and frontline staff explore opportunities for improved vaccination clinic efficiency. The goals of the project were to enhance research-practice collaboration, promote regional sharing among counties, and to explore existing and new practical tools that allow counties to successfully integrate the predictive benefit of sophisticated computerized modeling into their vaccination clinic planning and implementation.

This research brief describes the partnership between the Southern Piedmont Partnership for Public Health (SPPPH) and the North Carolina Preparedness and Emergency Response Research Center (NCPERRC) that explores the utility of regional research-practice collaboration and integration of systems engineering concepts and clinic planning tools into local public health mass vaccination clinic planning.

Model building process

In the spring of 2010, the Southern Piedmont Partnership for Public Health (SPPPH, 2011), a voluntary association of local health departments collaborating to improve public health practice, partnered with the North Carolina Preparedness and Emergency Response Research Center (NCPERRC) to explore the use of systems engineering modeling to help understand and improve their implementation of mass vaccination clinics. Though the use of systems engineering models for vaccination clinic planning is not a novel concept (Benecke, Pietz, & Callen), simulation models are not yet part of routine vaccination clinic planning efforts for many local health departments. Through the work of the NCPERRC, funded by the Centers for Disease Control and Prevention (CDC), this project is an effort to help bridge this research to practice gap. The project brings together experiences and expertise from local practitioners, researchers at North Carolina State University's Edward P. Fitts School of Industrial and Systems Engineering and the UNC Center for Public Health Preparedness at the UNC Gillings School of Global Public Health. Together, they are working to address real world local preparedness planning issues with collaborative, tailored, and innovative solutions.

As of summer 2011, project partners have used local data and had many discussions to develop a set of six county-specific computer simulation models of the local public health clinics set up during the H1N1 pandemic. The North Carolina local health departments that shared the details of their clinic operations were Cabarrus, Catawba, Cleveland, Lincoln, Mecklenburg and Union. The researchers sought to create reasonably accurate

depictions of the clinics by building Discrete Event Simulation (DES) models, developed using Simio® simulation software. These models have demonstrated preliminary local utility in several ways. First, the models created a computer animation that allowed locals to discuss their clinic configurations within and among other counties, and work together to discuss best practices and opportunities for maximizing efficiency and patient satisfaction. These animations may also be beneficial in pre-event and just-in-time-training (See Figure 1). Once validated, these models also created an opportunity to explore the impact of alternate staffing levels, clinic flow, etc. without having to conduct a full exercise to test a number of different scenarios.

The project strives to create a set of practical tools (e.g., videos of clinic animations and tables of model outputs for various resource allocation), based on the results from advanced simulation models. These tools will supplement the existing toolkit of planning resources developed by other projects (see Additional Resources) that can be used by frontline staff and leaders before or during an event to confidently plan and adjust configuration plans to meet community and organizational needs. Contingent on the continuation of project funding, the project will work in the fall of 2011 to compare and test new and existing tools as well as partner with other projects that are using similar methodologies to improve local vaccination clinic training, planning, and implementation.

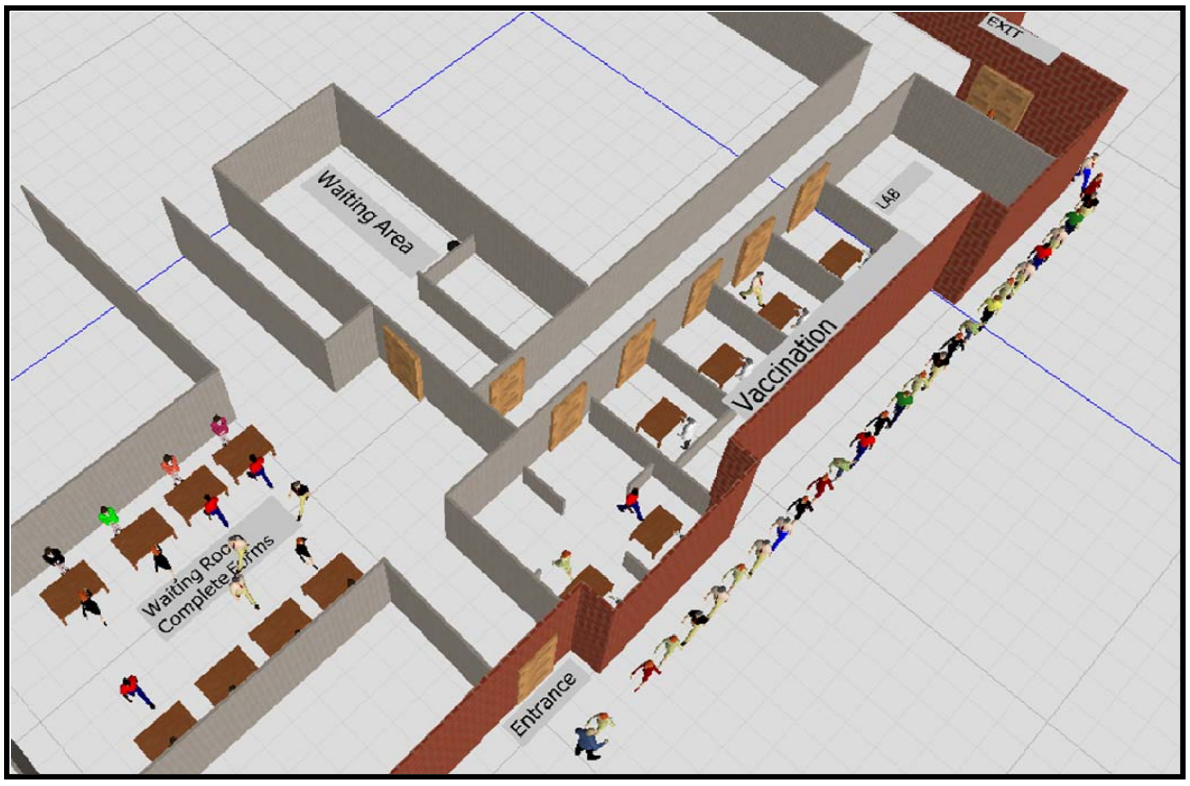

Figure 1: Screen capture of clinic configuration animation based on H1N1 mass vaccination clinic in Lincoln County, NC.

The research was carried out by the North Carolina Preparedness and Emergency Response Research Center (NCPERRC) at the University of North Carolina at Chapel Hill's Gillings School of Global Public Health and was supported by the Centers for Disease Control and Prevention (CDC) Grant 1Po1TP000296. The contents are solely the responsibility of the authors and do not necessarily represent the official views of CDC. Additional information can be found at **http://cphp.sph.unc.edu/ncperrc**.

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Additional Resources

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