MedicalXpress

Computational modeling can help plan vaccine introduction, study finds

September 29 2011

Proper planning before the introduction of new vaccines into a developing country's active immunization program could prevent storage problems and transportation bottlenecks that decrease the availability of existing vaccines by as much as two-thirds, according to a University of Pittsburgh study.

Computational models can assess the evolving needs of the vaccine supply chain – or the series of steps required to get a vaccine from the manufacturer to the target population. The modeling can forecast the impact of new vaccine introduction and identify potential disruptions, concluded the study, which will appear in the November issue of the *American Journal of Public Health*.

"Our study highlights the importance of prior planning when introducing new vaccines to avoid last-minute temporary fixes," said the study's lead author, Bruce Y. Lee, M.D., M.B.A., assistant professor of medicine, epidemiology and biomedical informatics at the University of Pittsburgh. "New vaccines may not fit smoothly into supply chains and therefore fail to reach their target populations easily. These problems may prevent other vaccines from reaching clinics as well. Manufacturers and policymakers should consider vaccine quantity and packaging before designing vaccines and introducing them in unfamiliar areas with limited resources."

The Pitt scientists, who are part of the Bill and Melinda Gate Foundation-funded Vaccine Modeling Initiative, developed a computational model to

determine the impact of introducing rotavirus vaccine and the 7-valent pneumococcal conjugate vaccine to Niger's Expanded Programs on Immunization vaccine supply chain.

Thousands of West African children die every year from rotavirus and pneumococcal disease, such as pneumonia. The Expanded Program on Immunization (EPI) is a World Health Organization initiative that aims to make vaccines that can prevent these deaths available to all children around the world.

Introducing the rotavirus vaccine and the pneumococcal conjugate vaccine to Niger's EPI vaccine supply chain could displace other EPI vaccines from already limited storage and transport space and could prevent EPI vaccines from reaching patients, the study found. The scientists estimated introducing these vaccine inventories to the supply chain could decrease vaccine availability by 24 percent to 69 percent.

The study's predictions are similar to what happened when officials introduced rotavirus vaccine to a Latin American program in 2006 and 2007, the researchers noted. In that case, bulky vaccines displaced existing EPI vaccines in already limited refrigerator space and forced overburdened health care workers to carry additional thermoses to transport the new vaccines. As a result of these unforeseen problems, large stocks of vaccine expired.

Computational models can help decision makers plan and understand complex systems, Lee said.

"Although computational models have been widely used in similar logistics planning in many other industries, such as transportation, manufacturing, the military and aerospace, their use in public health has been comparatively limited," he said. "These models could be a very helpful tool for health workers to plan vaccine supply chains."

Provided by University of Pittsburgh