How a mathematical optimization can save lives

Humanitarian organizations have woken up to the fact that there are a lot of cost and lead time reductions to be saved by re-designing their distribution network. An investment in this can save lives when done right. This study aims at doing just that.

This study was made in collaboration with the United Nations Population fund - UNFPA. UNFPA works with reproductive health in the world by, among other things, delivering emergency kits to disasters such as the earthquake in Nepal 2015 or the conflicts in Syria and South Sudan. These emergency kits contain products that can be used by doctors and others to facilitate safe childbirths or treat victims of rape. The organization hopes to save costs, and thus be able to help more people, by re-designing their distribution network and re-placing their warehouses. Currently, UNFPA only has one warehouse in Amsterdam, the Netherlands.

To do this the authors developed a facility location model that accounted for a number of factors. The model used the total demand of reproductive health in disaster-stricken populations that UNFPA serve, the shelf life of the emergency kits, the transportation costs to and from warehouses as well as specific factors that aims at describing the contextual, logistical factors of the nations that the warehouses could be located to. To solve the optimization problem in the model a computer program was used to optimize the warehouse locations based on cost and lead time. The results of the optimization showed that UNFPA could save costs and reduce lead times by moving part of their stock of emergency kits to the United Nations Humanitarian Resource Depots - UNHRD - in Accra, Ghana and Dubai, UAE.

The facility location model that was developed presents a new way of incorporating the shelf life of products, such as medicines, whilst using a global, changing demand. The model that was developed can potentially help other humanitarian organizations facing similar challenges as UNFPA such as Médecins Sans Frontières or the World Health Organization.

UNFPA:s goal is to ensure a world where everyone has reproductive health rights and it is our belief that, in this instance, a bit of mathematical optimization can go some way to create such a world.