Title:
Modeling Emergency Medical Service Locations under Consideration of Uncertainty – Case Study for the City of Duisburg, Germany

Abstract:
Site planning for emergency medical services (EMS) is essential to ensure a rapid and efficient response to emergencies. This strategic decision includes selection of sites, their capacities and allocation of ambulances to chosen sites. In practice, a variety of different uncertainties have to be taken into account, like response times, emergency demand and ambulance busyness are not precisely known. For the sake of simplicity, these uncertainties are often neglected in EMS location planning models, which may lead to undesired discrepancies between modeled coverage and reality.

Therefore, we propose to model EMS location planning under consideration of different uncertainty aspects. To this aim, we extend a recent stochastic EMS location planning model, which models expected coverage while maintaining a linear formulation. To evaluate the model’s applicability, we conduct a real-world case study and perform a discrete event simulation for the city of Duisburg with one year of historical emergency data. Duisburg is located in the Metropolitan Region Ruhr in Germany with about 0.5 million inhabitants. Preliminary results show that expected coverage can be modeled more realistically by acknowledging various uncertainty aspects in EMS location planning. At the same time, computational complexity is low enough to maintain solution quality. We examine different numbers of site locations and ambulance allocations and their influence on expected coverage and response times. Therefore, we provide decision support to the EMS providers in Duisburg.

Keywords:
Emergency Medical Service, Location Planning, Uncertainty, Case Study, Duisburg
Bio:
Isabel Wiemer is working as a research associate at the Chair of Business Administration and Production Management at the University of Duisburg-Essen, where she is also enrolled as a PhD student. She obtained a Master's degree in Management and Economics with focus on Operations Research at the Ruhr-University in Bochum. During her Master's studies, she worked as a research assistant at the Chair of Operations Research and Management.

Her main research interest is Operations Research applied to health care with particular focus on location planning of emergency medical services. In cooperation with the fire department of Duisburg, she analyses the ambulance location planning considering economic, geographical, and demographic challenges in Duisburg.