

Optimising Heterogeneous Ambulance Fleet Allocations in Jakarta

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Ambulance services have a duty of care to the clinical outcomes of the population they serve, and therefore aim to maximise the chances of survival and improve patient outcomes following a medical emergency. Despite this, although the ambulance allocation problem has been widely studied, it has predominantly focused on minimising response times or maximising coverage alone, and not explicitly for considering patient outcomes. In this paper we propose a modelling approach to consider where to best allocate different types of emergency response vehicles in order to maximise patient outcomes within a heterogeneous population. To achieve this, we develop a metaheuristic algorithm for finding better fleet allocations which is used in conjunction with a discrete-event simulation model of ambulance services with heterogeneous vehicles. A major contribution of this metaheuristic is the numerical solution of a system of equations to approximate the utilisation of vehicles. Traditionally this utilisation is problematic as it is both an input and an output of the allocation of vehicles. Our approach is informed by, and tested on, real-world data from Jakarta, Indonesia. Using our developed models, decision makers are better able to understand ambulance fleet capacity needs and allocations, and their impact on patient outcomes.

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