Locating Roadside Clinics in Sub-Saharan Africa

H. de Vries¹, A.P.M. Wagelmans², J.J. van de Klundert³

¹Humanitarian Research Group, INSEAD School of Business
²Econometric Institute, Erasmus University Rotterdam
³Institute of Health Policy and Management, Erasmus University Rotterdam

For more information, contact:
Name: Harwin de Vries
E-mail: Harwin.devries@insead.edu

Difficult work environment
- Stress, loneliness
- High-risk sexual behavior
- Vulnerable to HIV, STIs, Tuberculosis, Malaria, ...

Traditional health system
- Difficult to access for truck drivers
- Insufficient parking space
- Opening hours
- Truck drivers don’t deviate

Roadside Wellness Centers (RWCs)
- Clinics placed at busy truck stops: hotspots
- 38 RWCs in 10 countries in SSA
- Reduce barriers to access

5 service packages
- Primary care services
- STI, Malaria, Tuberculosis & HIV services

Decision problem
- Locations of a given number of new Roadside Wellness Centers
- Which optional service packages these RWCs should offer

Optimization criteria
1. Maximize patient volume
   - Choose locations that attract many truck driver patients
2. Enhance continuity of access
   - Choose locations that ensure adequate access at any point of time during the truck drivers’ trips
   - Travel time gaps between RWCs should not be too large
   - Particularly important for health services that require frequent clinic visits (HIV treatment)

Measuring access to healthcare
Traditional access measures
- Based on distance/time between patient and provider
- Not suitable for mobile patients like truck drivers

Three access measures for mobile patients
- CTL: fraction of time within a critical time limit from a health facility
- RCTL: fraction of time within a critical time limit & fraction of time within a recommended time limit
- ASAP: expected travel time to nearest facility when needed

Solution method
Mixed Integer Programming (MIP) formulation
- Objective function:
  \[ \text{max } r \cdot \text{Patient Volume} + (1 - r) \cdot \text{Continuous Access Score} \]
- Continuous Access Score:
  \[ \sum_{\text{Service packages} \ s} \sum_{\text{Truck Routes} \ q} \left( \text{Truck Volume}_q \cdot \text{Access Score}_{eq} \right) \]
- Solved by CPLEX 12.5

Case study: Southern & Eastern Africa Network
1. Location decisions have a big impact in terms of continuity of access.
   - E.g., situation along two major corridors before and after adding 4 RWCs to the network:

2. Increasing continuity of access does not need to harm patient volumes.

3. Location decisions are generally very robust w.r.t. data impreciseness.
   - Quality of location decisions remains high when randomly drawing “true” parameter values:

4. Synergy effects by placing multiple facilities
   - Network planning is very beneficial
   - Long term perspective is key