

LOCATION PROBLEM

Decisions

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

OPTIMIZATION CRITERIA

- Maximize patient volume**
 - Choose locations that attract many truck driver patients
- 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/ travel 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:

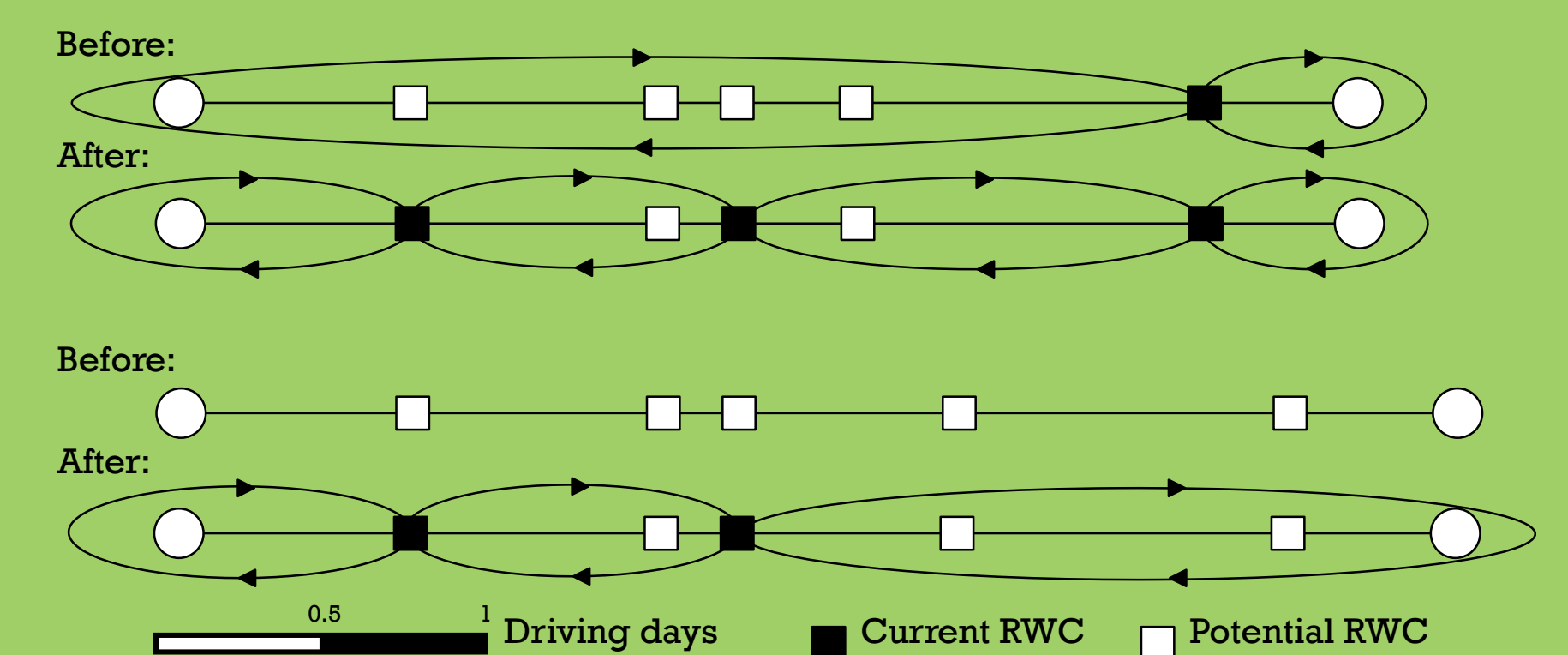
$$\max r \cdot \text{Patient Volume} + (1 - r) \cdot \text{Continuous Access Score}$$
- Continuous Access Score:

$$\sum_{\text{Service packages: } s} \sum_{\text{Truck routes: } q} (\text{Truck Volume}_{sq} \cdot \text{Access Score}_{sq})$$
- Solved by CPLEX 12.5

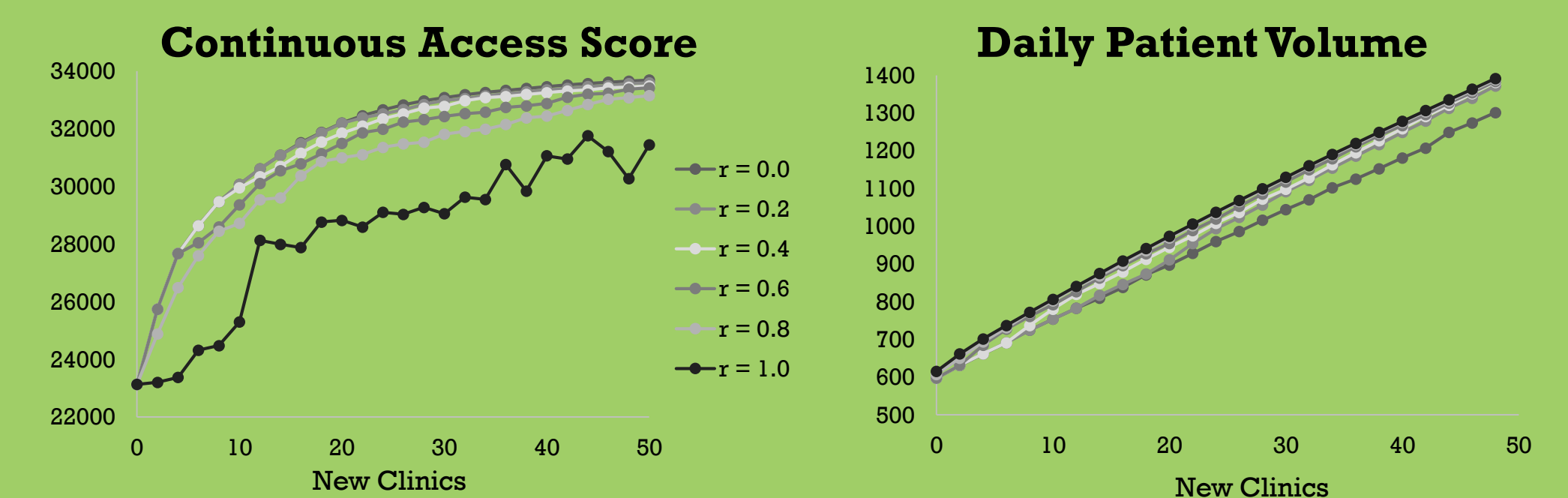
CASE STUDY RESULTS

Case study: Southern & Eastern Africa Network

- 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:



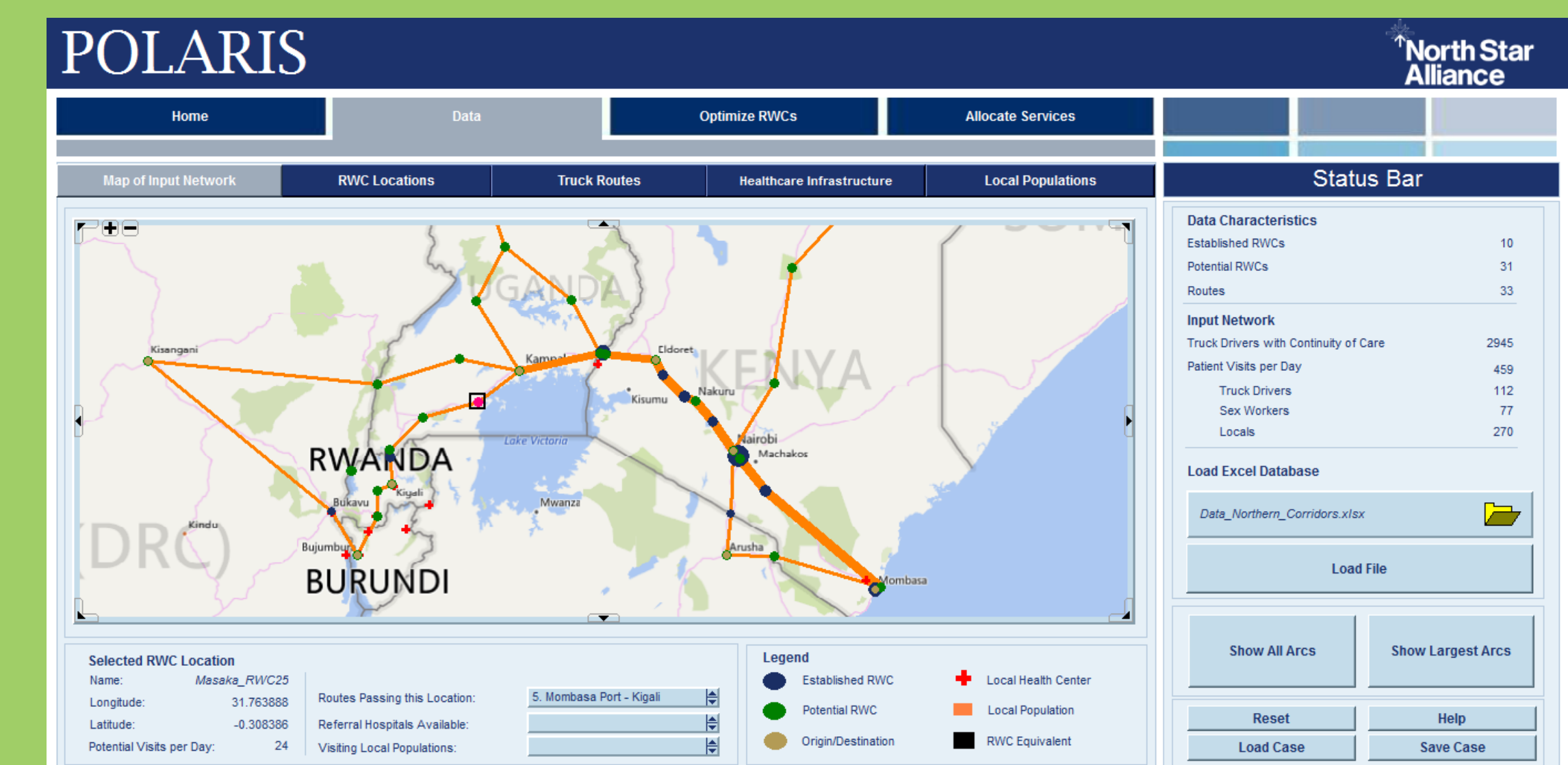
- Increasing continuity of access does need to harm patient volumes.



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

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

DECISION SUPPORT TOOL



TRUCK DRIVERS IN SUB-SAHARAN AFRICA

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

NORTH STAR ALLIANCE

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

