BEUTH HOCHSCHULE FÜR TECHNIK BERLIN
University of Applied Sciences

Modelling of catchment areas for health facilities in Africa

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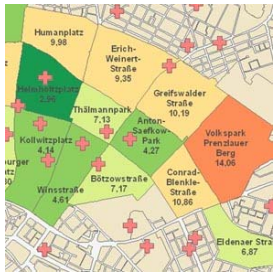
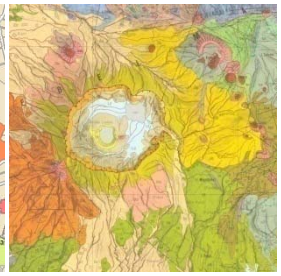
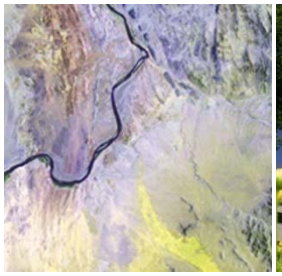







Outline

- Introduction
- Examples from South Africa and Kenya
- Application on Rwanda
- Difficulties/Limitations
- Findings
- Further steps

Introduction

- Health Management Information System (HMIS) in Rwanda: data on health centre level
- Estimation of catchment areas (in general 5 km or one hour by foot)
- Ability of estimating population to be served

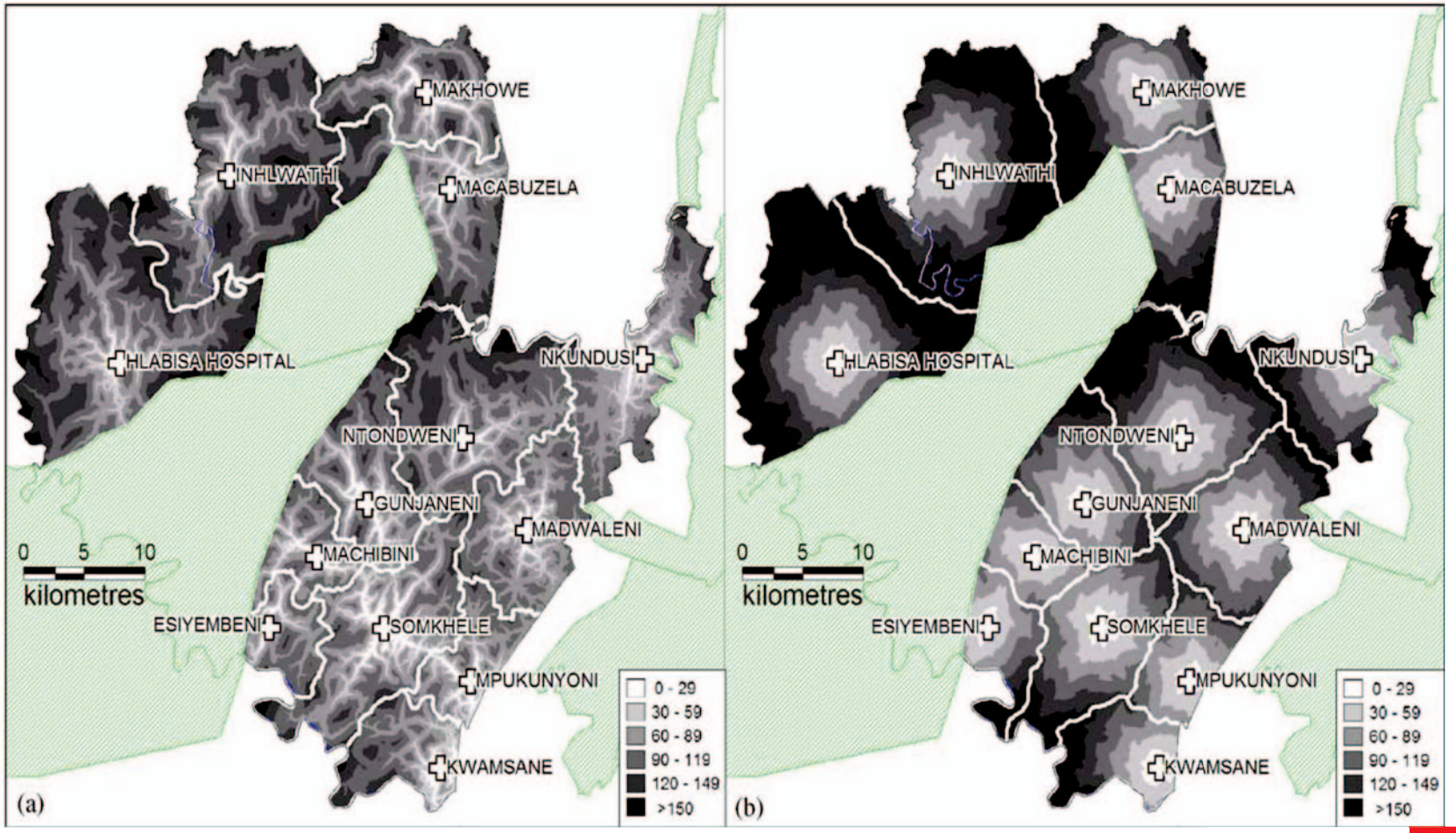
Examples from South Africa and Kenya

- Tanser, F., Gijsbertsen B. & K. Herbst (2006): Modelling and understanding primary health care accessibility and utilization in rural South Africa: An exploration using a geographical information system. Social Science & Medicine, 63: 691-705.
- Noor, A.M., Amin, A.A., Gething, P.W., Atkinson, P.M., Hay, S.I. & R.W. Snow (2006): Modelling distances travelled to government health services in Kenya. Tropical Medicine and International Health 11, no. 2: 188-196.

Example from South Africa

- Public transport model (network) & walking model (Euclidean distances)
  - Proportion of homesteads using public transport
  - Quality and distribution of road network
  - Barriers (perennial rivers, nature reserves)
  - Reported travel times
- Limitations:
  - No further topography considered, average usage of public transport, assumed equally spread coverage of public transport
- **91% of clinic usage predictable**

Example form South Africa



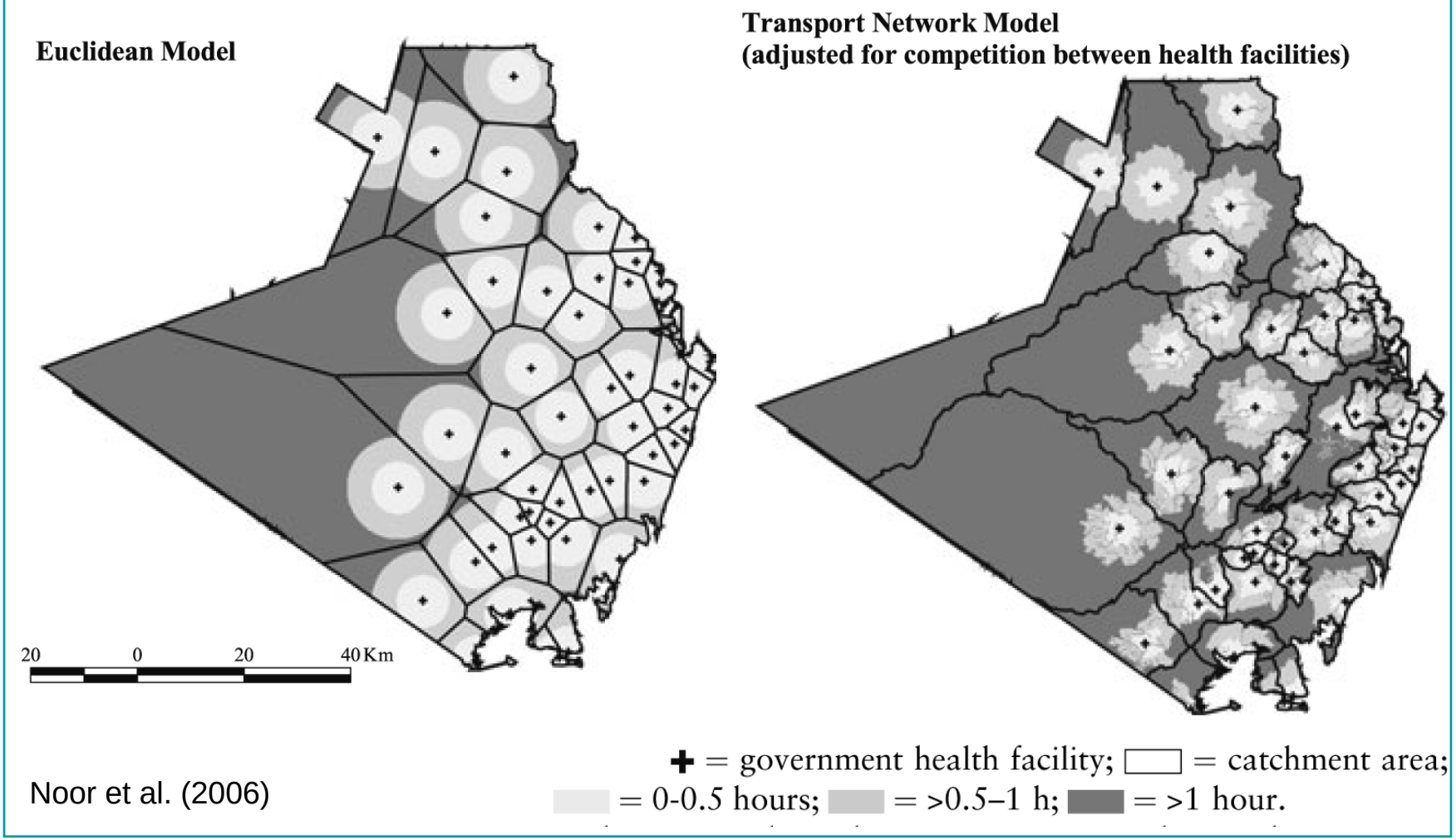
Tanser et al. (2006)

Example from Kenya

- Walking model for travel time
  - Transport network with travel speed by foot based on Langmuir (1984)
  - Topography
  - Natural barriers
  - Population density
- Choice between different types of facilities

- **Competition-adjusted transport network: overall accuracy of 84%**

Example from Kenya

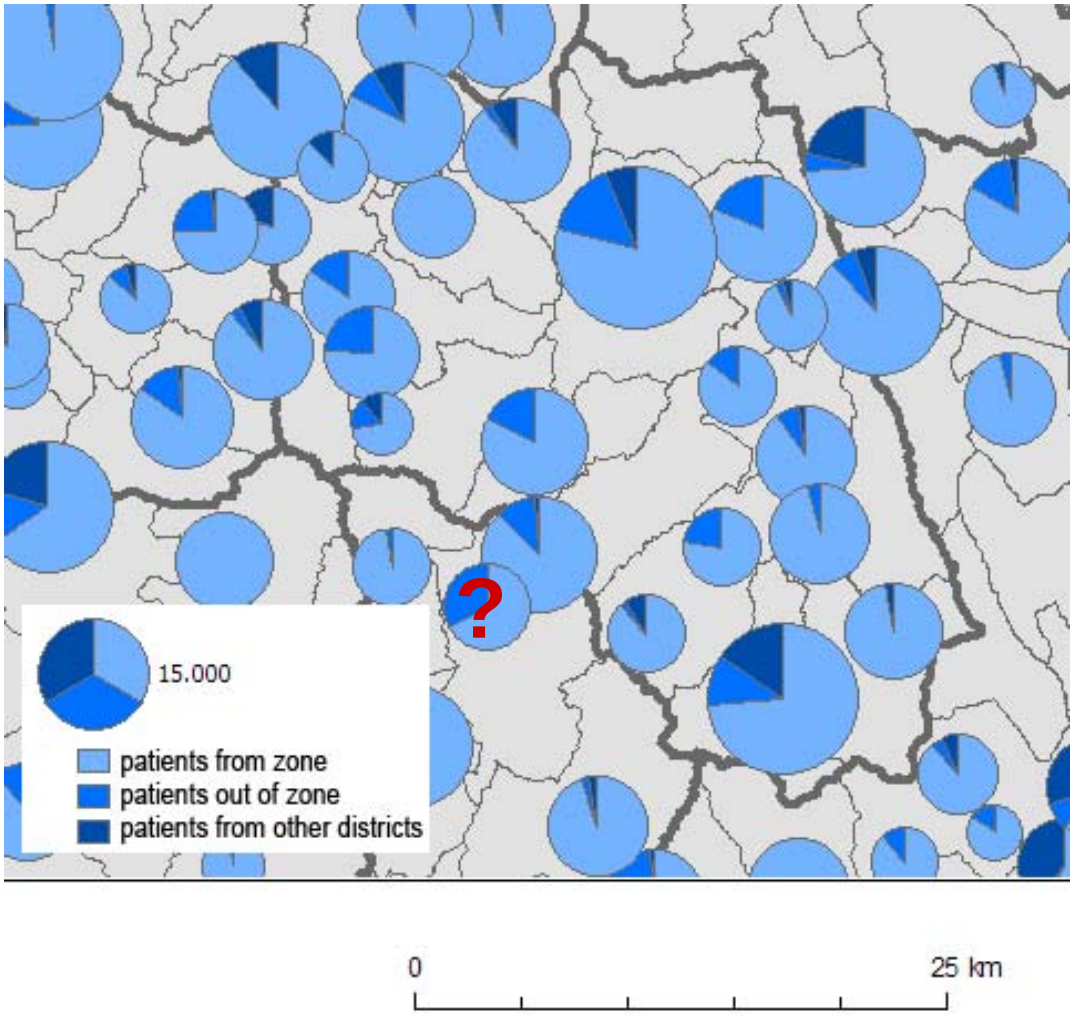


Noor et al. (2006)

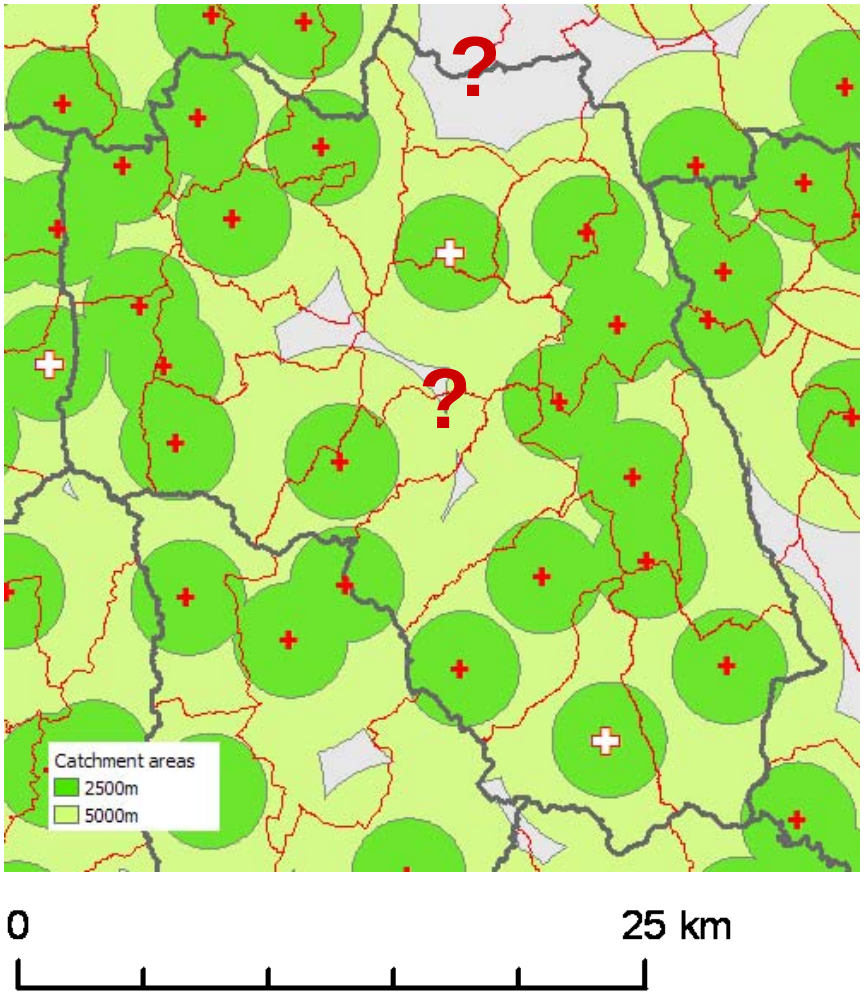
Application on Rwanda

- Unclear how population to be served is estimated (5 km or one hour by foot)
- Geographical coordinates of health facilities (GPS)
- Aggregated data available about origin of patients (zone, out of zone, out of district) on health facilities level

Origin of patients

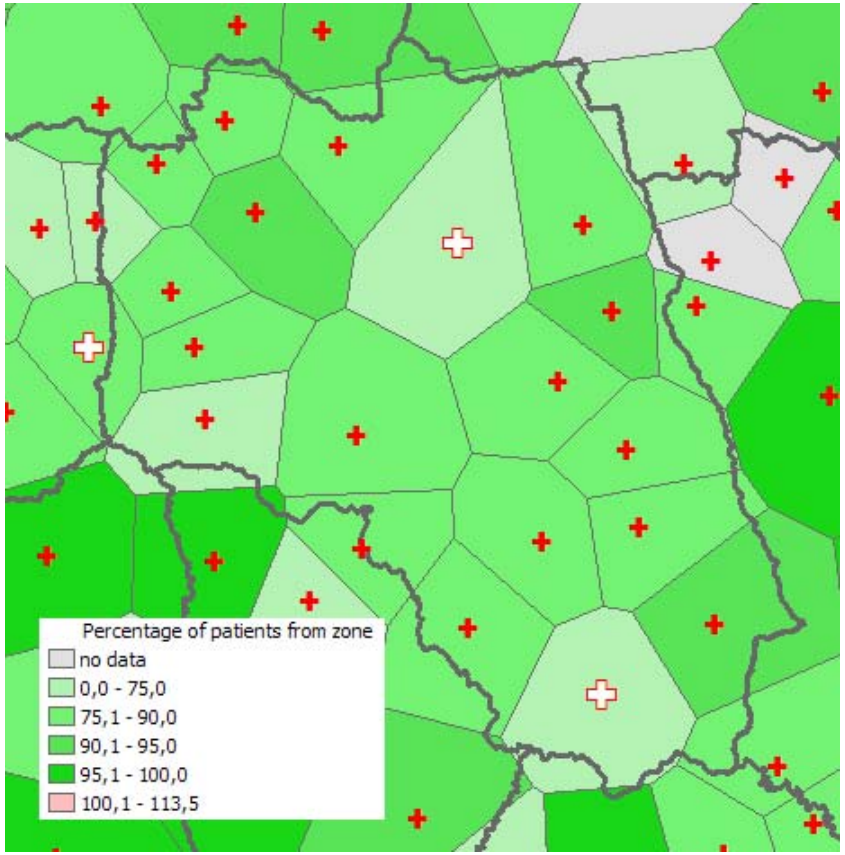


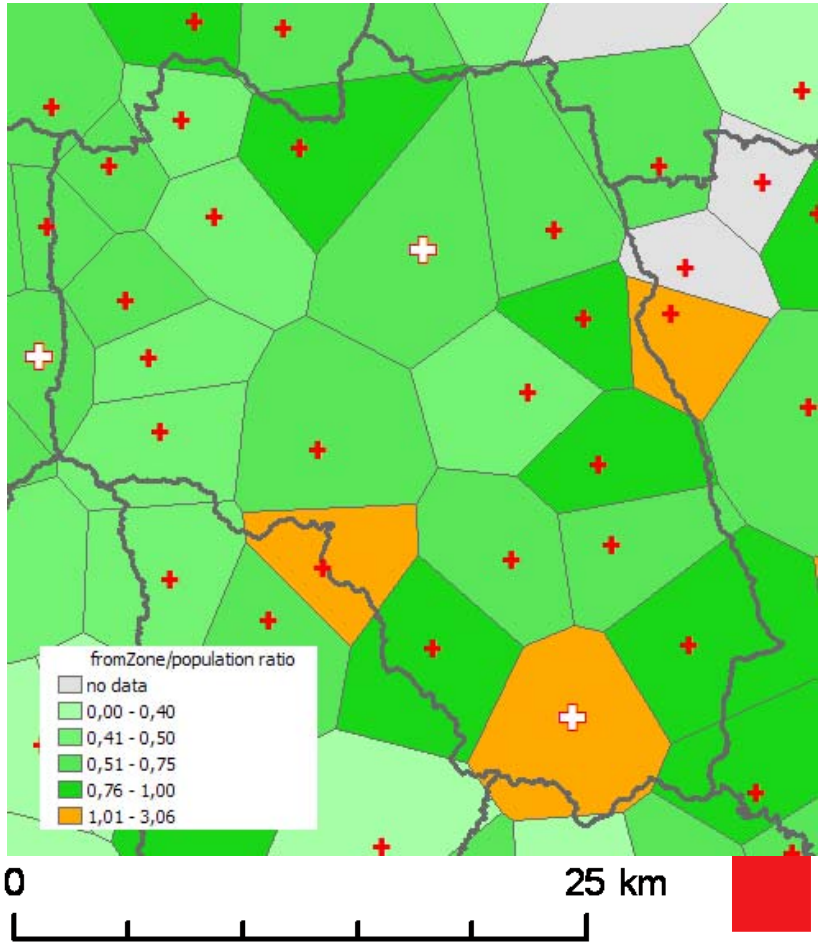
Application on Rwanda



- Buffer zones in 2500m and 5000m distance
- gives the impression of missing health centres (or missing data)

Application on Rwanda





Difficulties/Limitations

- Incomplete coordinates for health centres
- Incomplete road’s data
- Wrong/inconsistent data (roads, health centres, geometry and data)
- Data about origin of patients is available only aggregated

Findings

- Patients are coming from other zones than the assumed catchment areas (5-30%)
- Euclidean distances have been proved to underestimate travel time in Kenya
- Network analysis proved to give better results in South Africa → until now limitations in Rwanda

Further steps

- Retrospective data of origin of patients
- Fieldwork in health centres will give an idea of travel time, means and cost of travelling as well as reasons for choosing a certain health centre
- Consideration of results from fieldwork as well as barriers (water, elevation) for modelling
- Development of a “weighting system”
- Downscaling of population and calculation for catchment areas

Acknowlegdements

- Centre for Geographical Information Systems and Remote Sensing at the National University of Rwanda (CGIS-NUR)

CGIS Centre
Geographic Information Systems & Remote Sensing training & research Centre

- Ministry of Health Rwanda

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Thank you for your attention!