Optimizing Population Screening for Infectious Diseases

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June 7th, 2017
Introduction: 2 challenges

1. Linking decisions to outcomes:
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Decisions  KPIs  Outcomes
2. Transforming insight into better decisions:
Introduction: 2 challenges

2. Transforming insight into better decisions:
Problem Description

- Human African Trypanosomiasis (HAT; sleeping sickness):
  - Slowly progressing parasitic disease
  - Transmitted by Tsetse fly
  - WHO: 30000 cases
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- Two disease stages (both appr. 1.5 years):
  1. Symptoms absent or non-specific
  2. Neurological problems
Problem Description

Population screening crucial:
- Infected people do not observe disease/ do not obtain care
- Source for infection of Tsetse
- Result: HAT spreads silently
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Current strategy (DRC)
- 30 mobile screening teams
Main research question:
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*Given current screening capacity...*
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- which villages to visit ...
Problem Description

Main research question:

Given current screening capacity...

- *which villages to visit* ...
- *at what time interval* ...

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Main research question:

*Given current screening capacity...*

- which villages to visit...
- at what time interval...
- to minimize the total average expected prevalence level?
Linking decisions to outcomes

Decisions

Outcomes
Link Between Decisions and Prevalence

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Transforming insight into better decisions

Decisions → Outcomes

Policy

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Frequency required for expected eradication

Required screening interval (years)

Sensitivity (%)  Participation (%)

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Solution method for the general planning problem

**Sophisticated methods:**
- Column generation
- MIP
- Local optimization
Solution method for the general planning problem

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- Column generation
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- Local optimization

Simple policies:
- Equalizing
- Filtering
- Differentiation
- Burden level
Solution method for the general planning problem
Solution method for the general planning problem

- Optimized
- Equalization
- Filtering
- Differentiation
- Burden-level

Average exp. # infected
Final exp. # infected

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Conclusions

Linking decisions to outcomes...

- can be complex
- becomes easier (more data)
- yields important insights
Conclusions

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- becomes easier (more data)
- yields important insights

Translating the link into decisions...
- can be essential
- can benefit both policy makers and people on the ground
- does not always require advanced tools