

# Patient's time and travel costs in anticoagulation management: Societal savings achievable with the shift from warfarin to direct oral anticoagulants

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*Time and travel costs associated with receiving healthcare services are often ignored in economic evaluations, even though they are critical to both society and patients*

*It has been shown that these costs should be included in the economic assessments of interventions that require regular monitoring and traveling*



# Atrial Fibrillation (AF)

- ◆ Warfarin has been the primary recommended anticoagulant drug for reducing the risk of stroke, but the safe use of it requires regular monitoring
- ◆ Monitoring is a major burden for patients, as they must travel to a clinic/laboratory for a blood test (measures the international normalized ratio: INR)
  - In Finland an average of 15 trips per year



- ◆ Warfarin could be replaced with direct oral anticoagulants (DOAC), which are more expensive but do not require any monitoring



Irregular and rapid heart rate that increases the risk of stroke, heart failure and other heart-related complications

# Aims of the Study

- ◆ To develop a georeferenced cost model and use it...
  - 1) To measure travel costs and the value of lost time associated with warfarin therapy
  - 2) And to investigate if DOACs induce any savings in the total societal costs of anticoagulation management
- ❖ Which costs more?
  - ❖ DOAC therapy (high drug price)
  - ❖ Warfarin therapy (low drug price but substantial monitoring, travel and time costs)

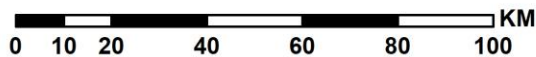
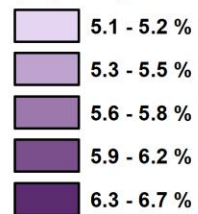


# Study Region - North Karelia in Eastern Finland

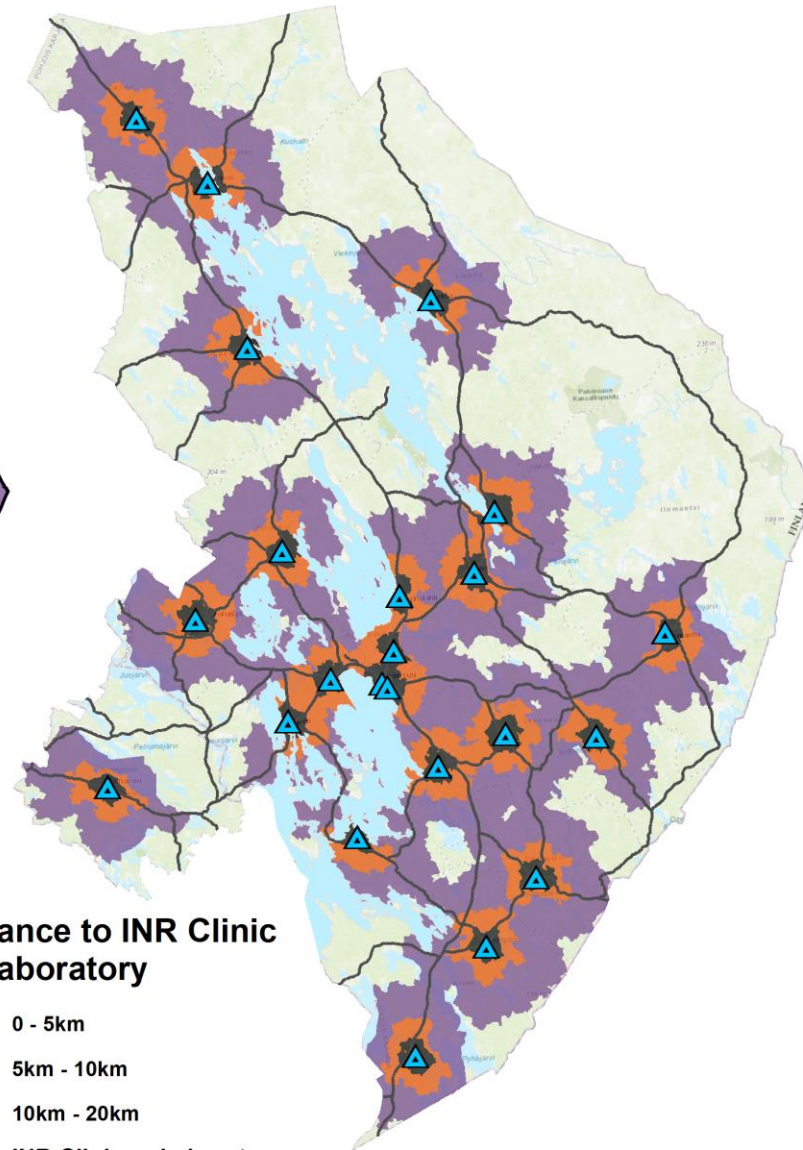
2017

- ◆ Equivalent in area to New Jersey
- ◆ 14 municipalities
- ◆ Degree of urbanization 76.2%
- ◆ 166,000 people
- ◆ 7,450 atrial fibrillation patients

Atrial Fibrillation (I48) Prevalence 2017  
(Age Adjusted 35-84 Years)



Distance to INR Clinic or Laboratory



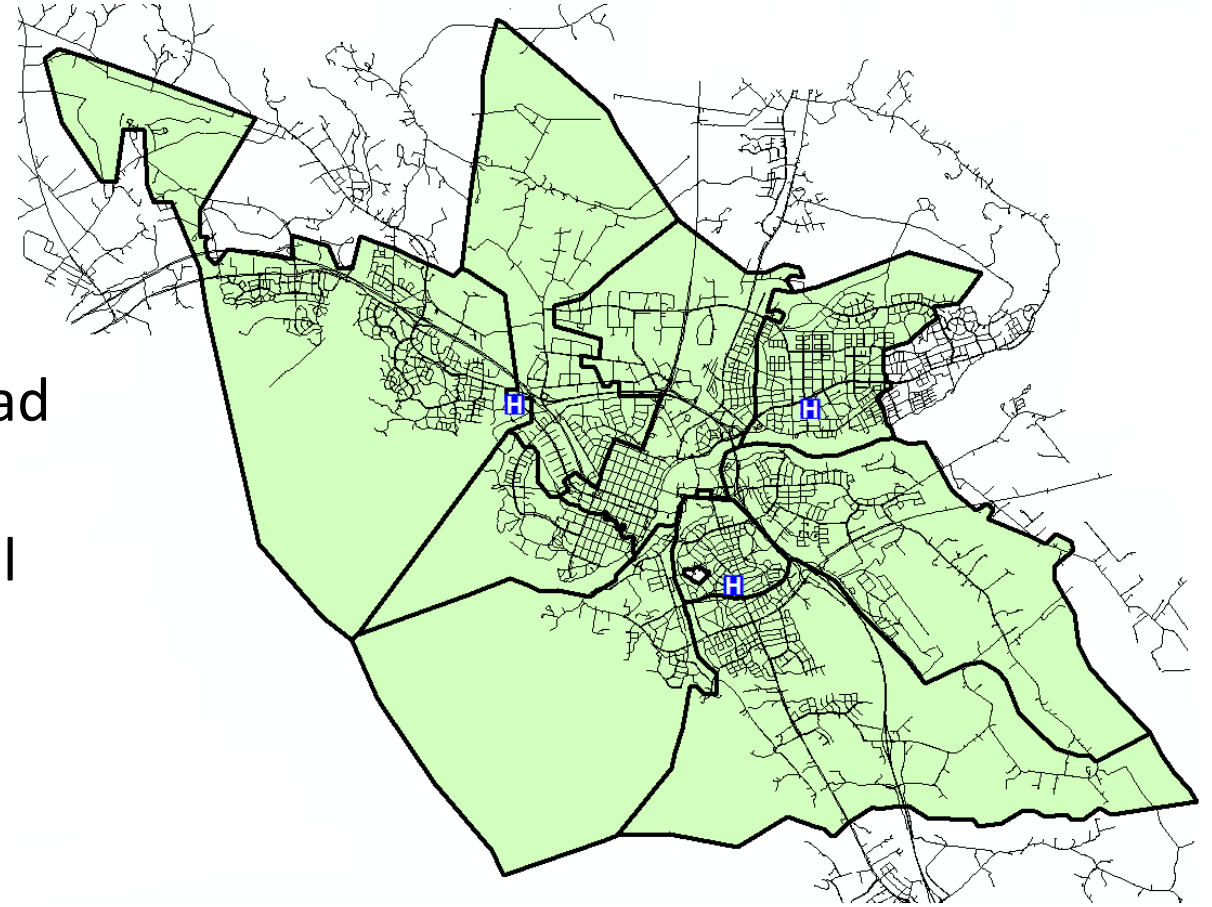
# Patient Register Data

- ◆ Real-world patient data from the regional patient database
  - ◆ 7,450 patients with atrial fibrillation (ICD-10 code I48) from 2017
  - ◆ Data of gender, age, domicile, diagnoses, laboratory results, prescriptions, and healthcare visits etc.
- ◆ Patients' home addresses were geocoded using Digitransit geocoding API in QGIS-software (98.9% could be located with street name and zip code)
- ◆ The used clinic/laboratory, and the number and the type of annual healthcare visits could be derived from the data



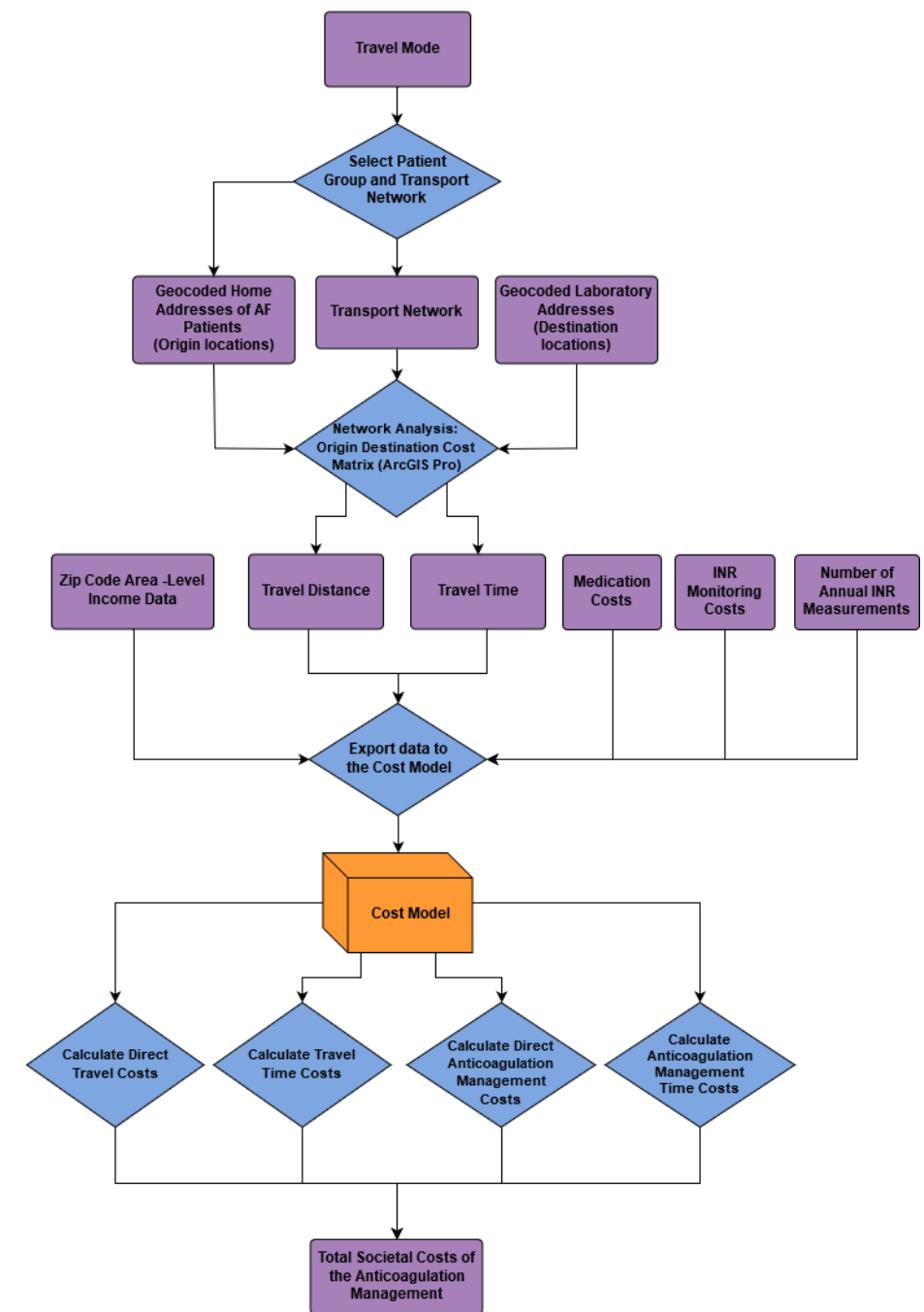
# GIS Data

- ◆ Clinic and laboratory locations
- ◆ Digital road network data based on Digiroad from Finnish Transport Agency
  - ◆ Used to calculate travel time and travel distance
- ◆ Zip code area income data
  - ◆ Used in the valuation of time



# The cost model

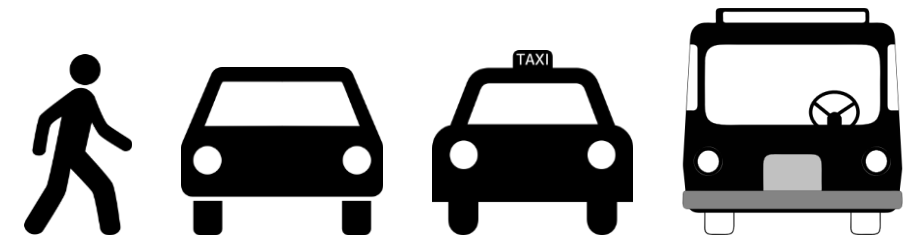
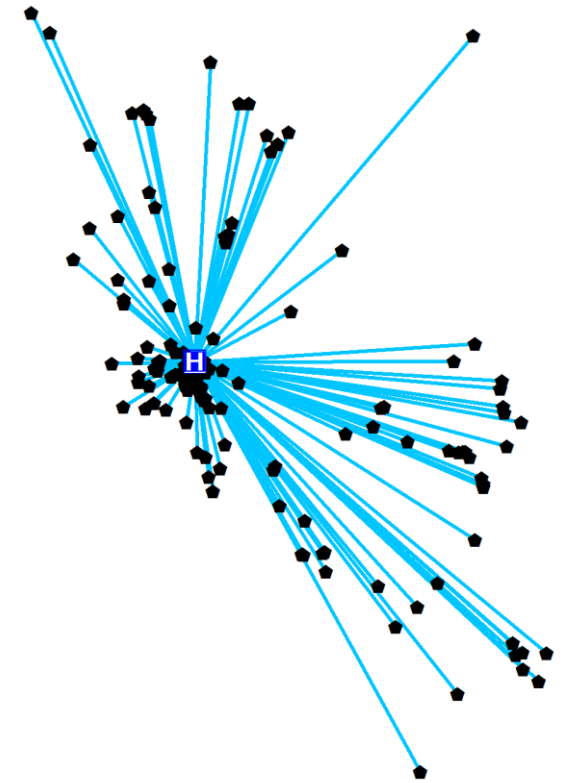
- ◆ The cost model consists of time and travel costs as well as healthcare related costs
  - ◆ Network analysis with Esri ArcGIS Pro 2.2
  - ◆ Final model in Microsoft Excel





# Network Analysis

- ◆ Origin-Destination (OD) Cost Matrix in ArcGIS
  - ◆ Travel modes: private car, taxi, bus, walking
  - ◆ Calculated travel time and distance between patient home addresses and clinics/laboratories based on the fastest routes along road network
    - ◆ Converted as monetary costs in the cost model
    - ◆ Travel time is valued based on hourly income (100% for working age patients and 35% for the leisure time of retired patients)



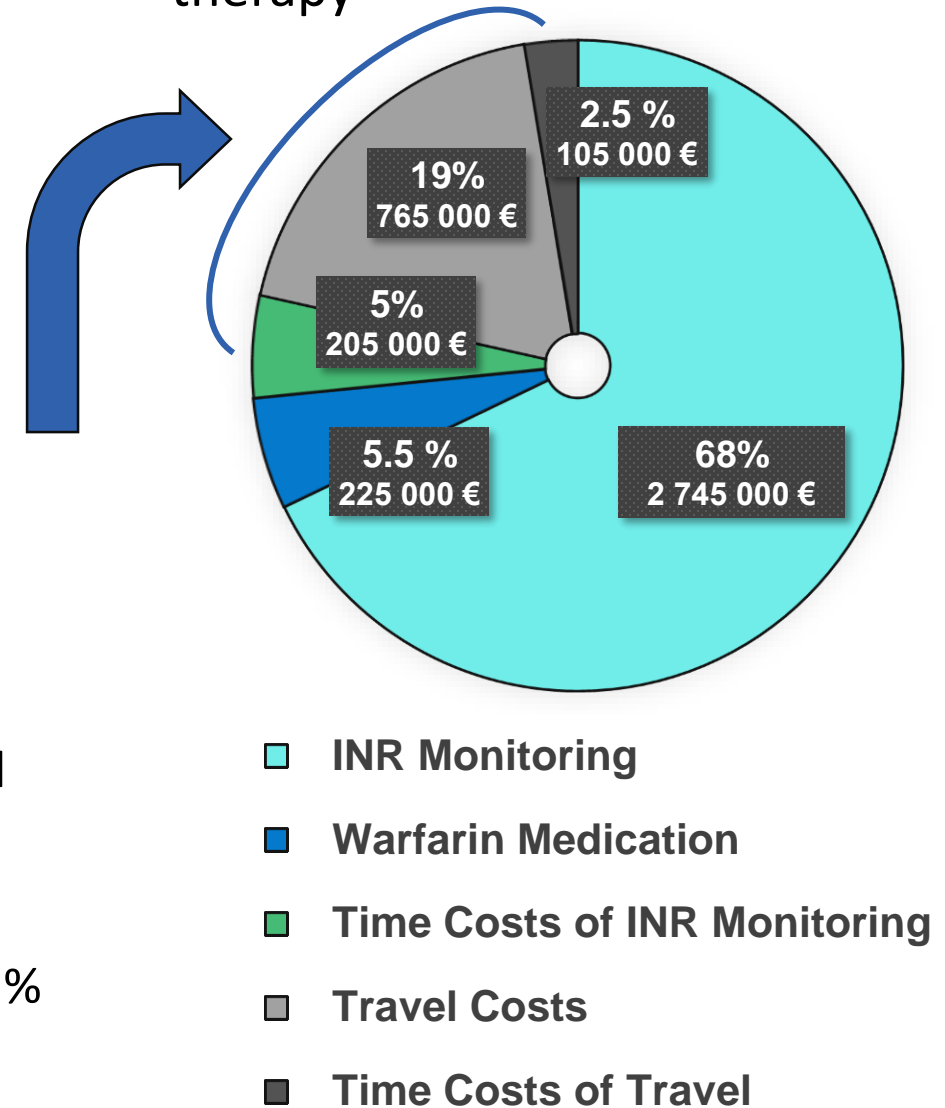
# Results

- ◆ Annual cost of warfarin therapy in North Karelia  
4 mill. EUR / 4.6 mill. USD
  - ◆ On average 835 EUR / 955 USD per patient
  - ◆ On average 52 EUR / 60 USD per monitoring visit
  - ◆ Time and travel costs constitute over 25 % of the total costs of warfarin therapy

## Savings achievable with the shift from warfarin to new oral anticoagulants:

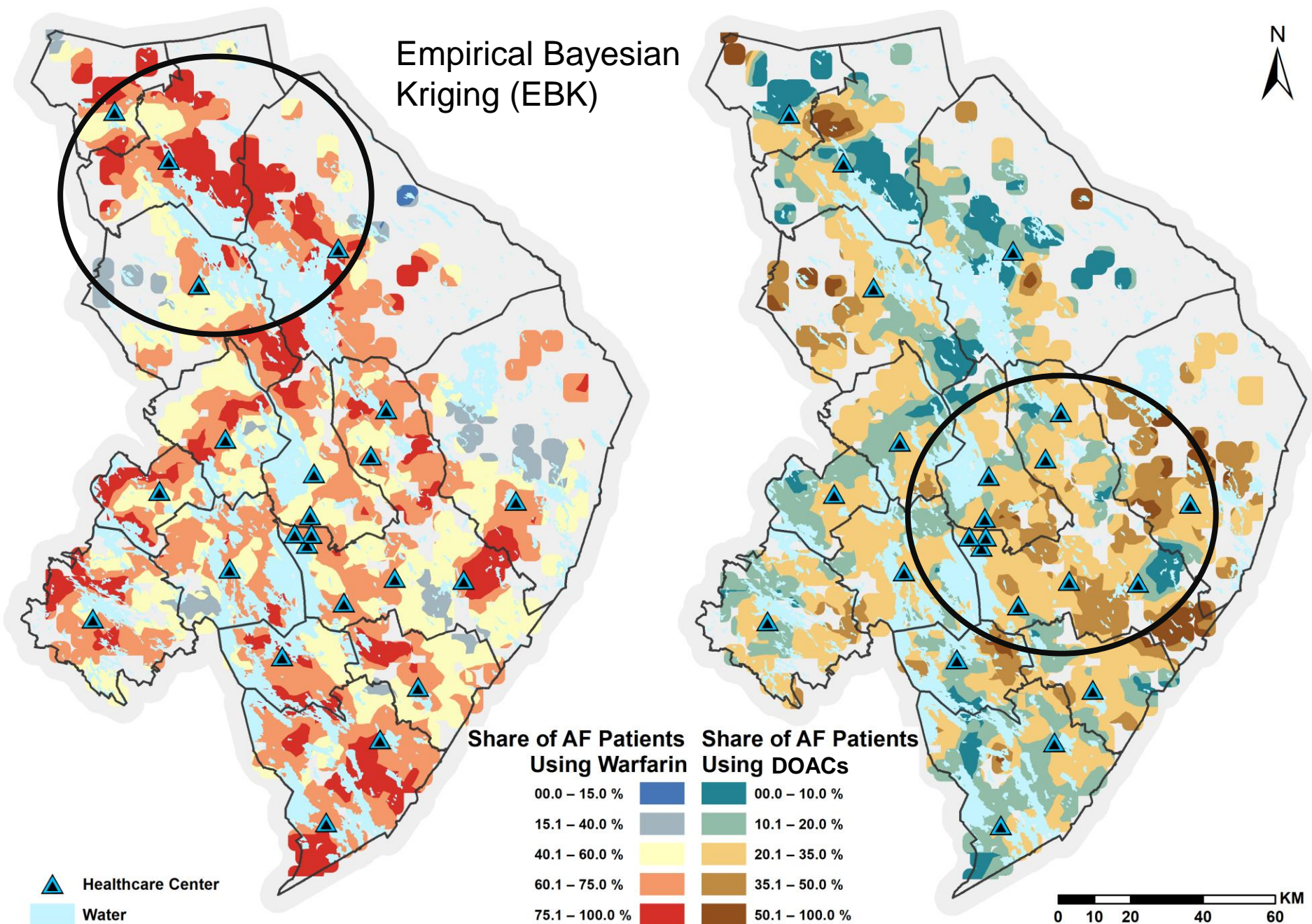
- ◆ The total societal cost of anticoagulation management would increase 2 % with current DOAC retail prices in Finland
- ◆ When measured with DOAC wholesale prices (the drug distributor's price), the total societal cost would decrease 14 %

Total cost of warfarin therapy



## Geographical differences in clinical practice

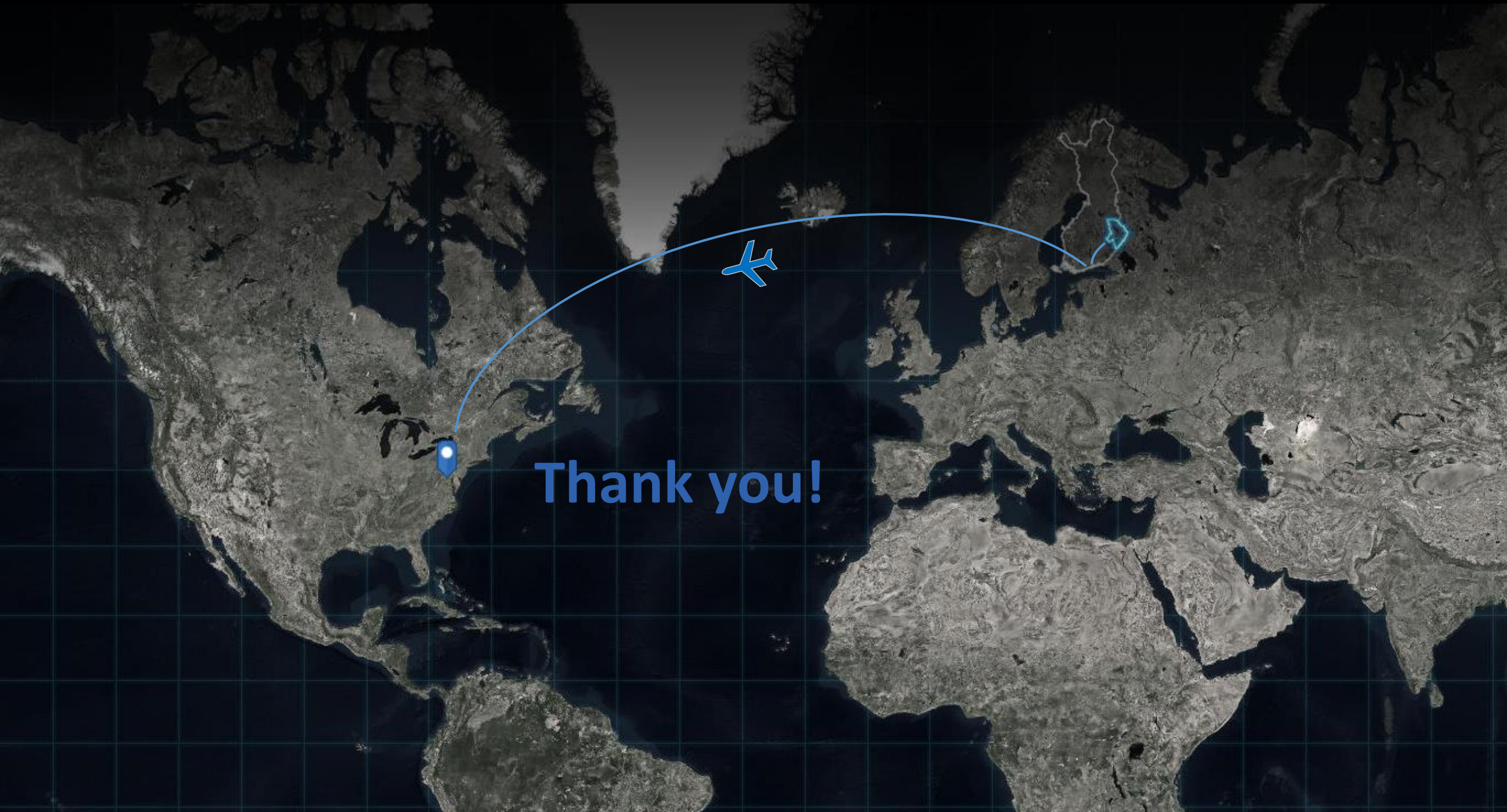
- ◆ Patient register data can be used to evaluate geographical differences
- ◆ Example: Some municipalities favor warfarin and others prefer DOACs
- ◆ Findings can be reported to improve the system



# Conclusions

- 1) Patients' time and travel costs critically increase the societal cost of warfarin therapy
- 2) DOACs are already a cost-effective alternative to warfarin, but the achievable savings are highly dependent on the DOAC prices
  - ◆ Most DOAC patents will expire by 2023 allowing the introduction of first generics
  - ◆ Meanwhile, from a patient's perspective the shift is beneficial, as it eliminates the burden of traveling and the dosage adjustment of warfarin
- 3) Our modeling approach can be applied to different geographical regions and to different healthcare processes requiring patient monitoring





Thank you!