

GEO-SPATIAL RISK ASSESSMENT OF ASTHMA HEALTH RESOURCE USE AT THE MUNICIPAL LEVEL IN THE GREATER HELSINKI METROPOLITAN AREA OF FINLAND

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Disclosures

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Background

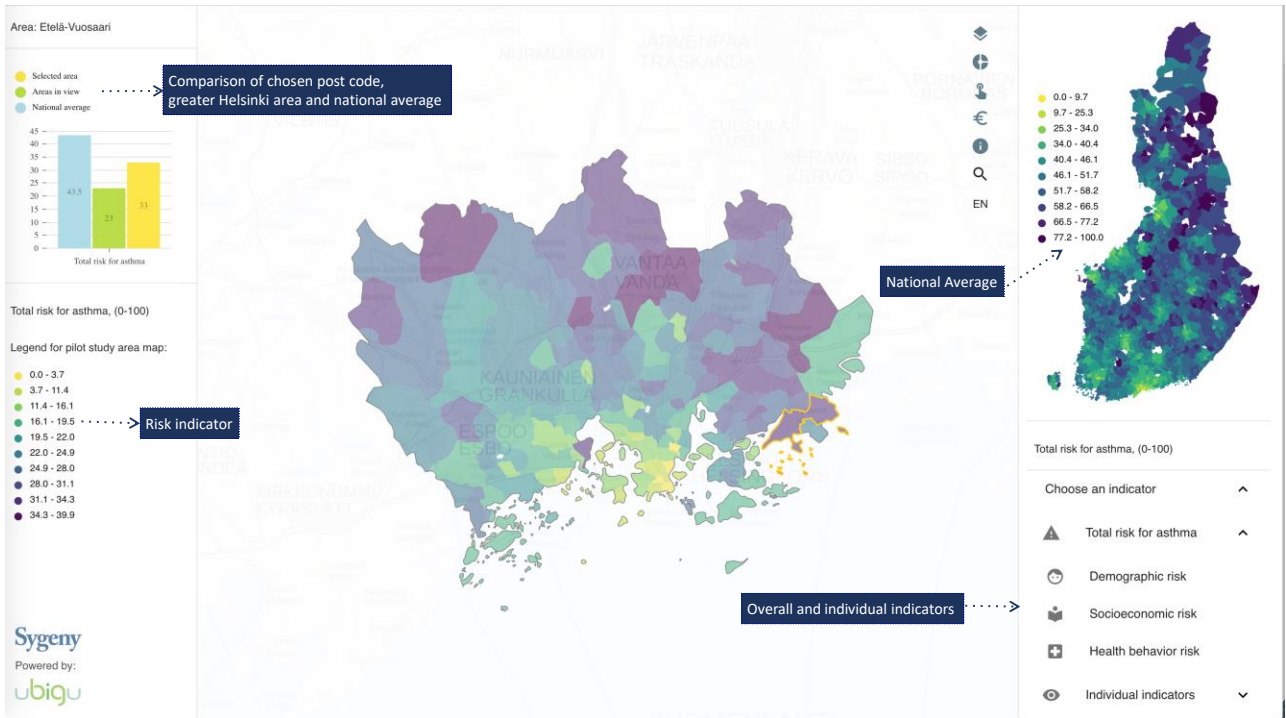
- The Finnish National Asthma Program (FNAP) was established over a 10- year period from 1994 to 2004 designed to reduce the burden of asthma in Finland.
- The FNAP involved a concerted effort to systematically plan, educate and implement early detection and treatment with ICS agents via networking and coordination of effort between primary and secondary health care providers.
- Overall asthma care improved with patients achieving better asthma control and substantially reducing costs with the FNAP program.
- However, recent follow-up studies suggest that the asthma care model that was based on the FNAP may not have led to long lasting asthma control, with a recent 10-year observational study showing that only about 20%-30% of adult patients achieving asthma control according to GINA guidelines.
- There is also some evidence that certain regions of the country may have asthma control outcomes that are sub-optimal when compared to other regions in the country.



Methods

- Description of the RAS tool:
 - The Risk Assessment (RAS) tool was developed as a demonstration tool to showcase the power of a comprehensive geo-informatics tool that can link relevant data sources by using a common geographical marker (e.g. municipal code), which is available in patient-level and publicly accessible data (such as public health data, census data, environmental data, etc.) to compute disease risk.
 - The current iteration of the tool computes and displays overall and composite asthma risk (demographic risk, socio-economic risk, health behavior risk).
 - The outcome of interest was based on asthma medication use intensity (a proxy for diagnosed and treated asthma) across the municipalities of the Greater Helsinki Metropolitan Area (GHMA) in Finland.
- Why asthma?
 - Asthma has a unique pattern of risk drivers given the multi-etiological nature of the condition that may also involve environmental, SES, behavioral, and healthcare resource use/access issues.



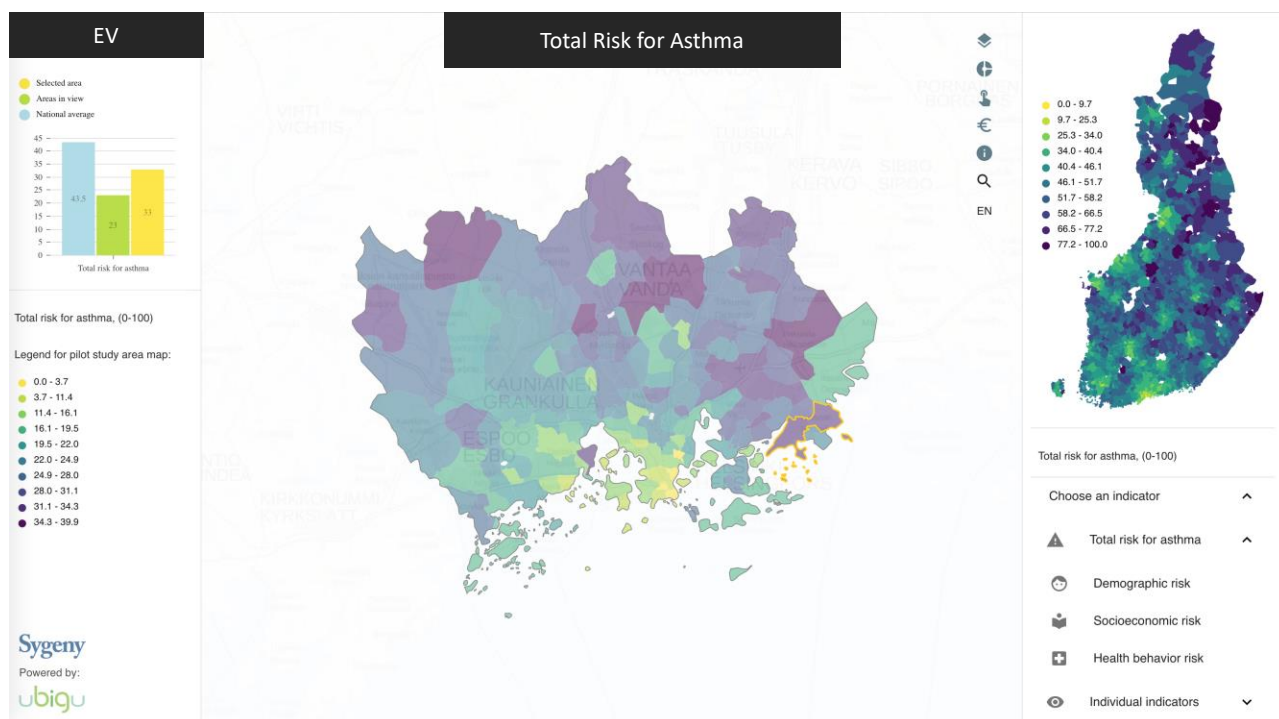


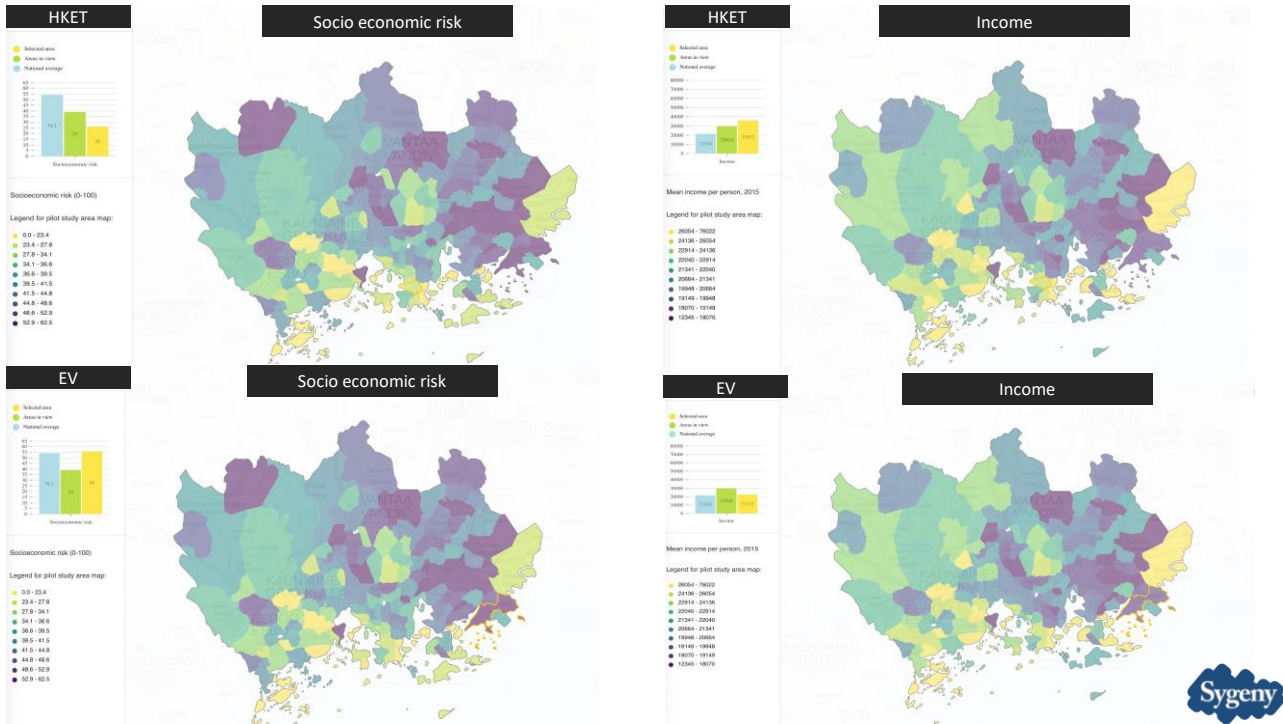
Methods

- Asthma risk was represented as a total risk score, which is a composite aggregation of three components: demographic risk (age, sex, etc.); socio-economic risk (income, unemployment rate, etc.); and health behavior risk (smoking, obesity, etc.).
- There were a total of 14 variables used in this model. The source data for this tool were derived from publicly accessible data in Finland.
- These risks scores were derived from a hierarchal approach that used principal components to identify risk groupings followed by a machine learning predictive analytics approach using the asthma medication intensity risk as the outcome measure.
- The composite risk score as well as the component scores were rescaled to a range of 0-100. These risk scores were computed for each municipality in the GHMA and displayed as heat maps for better visualization.

Results

- GHMA municipalities [Etelä-Vuosaari (EV) and Helsinki Keskusta/Etu-Töölö (HKET)] with similarly sized populations were chosen to demonstrate the differences in asthma risk.
- EV (pop. 22,616; average age: 40.0 years old; 46.3% males) had a total asthma risk score of 33.0, whereas HKET (pop. 18,035; average age: 40.0 years old; 47.3% males) had a total asthma risk score of 9.7. The national average is 43.5.
- EV total asthma risk was 3.4 times that of HKET. Some distinctions between the locations that may influence the risk include:
 - The % highly educated persons [21.90% (EV) vs. 52.20% (HKET)]
 - Average income [22,321 Euros (EV) vs. 35,952 Euros (HKET)]





Discussion

- There appears to be considerable heterogeneity in asthma risk within the GMHA population at the municipal level.
- In this assessment, drivers for asthma risk may be strongly related to socio-economic factors.
- This 'proof of concept' asthma risk model had 14 variables derived from only publicly available data sources.
- However, a limitation with the current model is that we are missing other potential explanatory variables (such as patient level clinical, medication utilization, healthcare resource utilization and humanistic information) that may account for the additional variation in asthma risk or asthma outcomes.

Conclusions

- The RAS tool provides deep insight into asthma risk, by utilizing relevant data sources linked by a common geographical marker.
- A key future effort would be to incorporate patient reported asthma control/quality of life assessments and asthma symptomology, along with smart inhaler and other sensor data, patient-level EMR or claims data, and the socio-economic, behavioral, demographic and environmental data explored here to build a more robust asthma geo-spatial model.
- Additional explorations (across therapeutic areas) are currently underway to evaluate the potential of the RAS tool to be used in 'real world' settings to better inform healthcare planning and resource allocation decision-making.



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Back-Up Slides

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References

- Haahtela T, et al. J Allergy Clin Immunol. 2017;139:408-14.
- Kauppinen RS, et al. Journal of Asthma. 2011;48:945–951.
- Hyrkas H, et al. Respiratory Medicine. 2016;113:1-7.
- Kauppi P, et al. Asia Pac Allergy. 2015;5:32-39.
- Tuomisto LE, et al. Respiratory Medicine. 2016;117:223-229.
- Vahatalo I, et al. Respiratory Medicine. 2018;137:70–76.
- Voutilainen A, et al. Scandinavian J Public Health. 2015; 43: 356–363.



Data Sources

- Input data from the following data sources were used in this study:
 - Statistics Finland – Paavo API -Open source data by postal code.
 - THL (National institute for health and welfare) SotkaNet API - Statistical information on welfare and health in Finland
 - THL ATH/FinSote – Area study on health, wellbeing and services of adults
 - Helsinki region statistical timeseries database ("Aluesarjat")
 - Helsinki region environmental services (HSY) – Open geospatial data (air quality indices)
 - National Land Survey Finland (NLS) – Open geospatial data (topographic database)

