

Using spatial data of residential history to study the health in Northern Finland Birth Cohort

Geoinformatics Research Days

4.5.2021 Tiina Lankila



A multidisciplinary group studying the natural and built residential environment, physical activity, cardiovascular and mental health, and subjective health and wellbeing in Northern Finland Birth Cohorts

- **Oulu Deacones Institute Sports Clinic (ODL)**
- **Center for Life Course Health Research (CLCHR), University of Oulu**
- **Geography Research Unit (GRU), University of Oulu**



Northern Finland Birth Cohort 1966



https://www oulu.fi/nfbc/nfbc1966_1986

NFBC 1966

- Longitudinal birth cohort of people born in the provinces of Oulu and Lapland in 1966 (12231 children)
- Data collected since 24th gestational week
- Follow-ups in 1, 14, 31 and 46 years of age

Data of health and well-being, health behaviour, sosioeconomy, health service use, morbidity and mortality

- Questionnaires
- interviews
- Clinical measurements
- Genomic data
- Register data



Northern Finland Birth Cohort 1966



https://www oulu.fi/nfbc/nfbc1966_1986

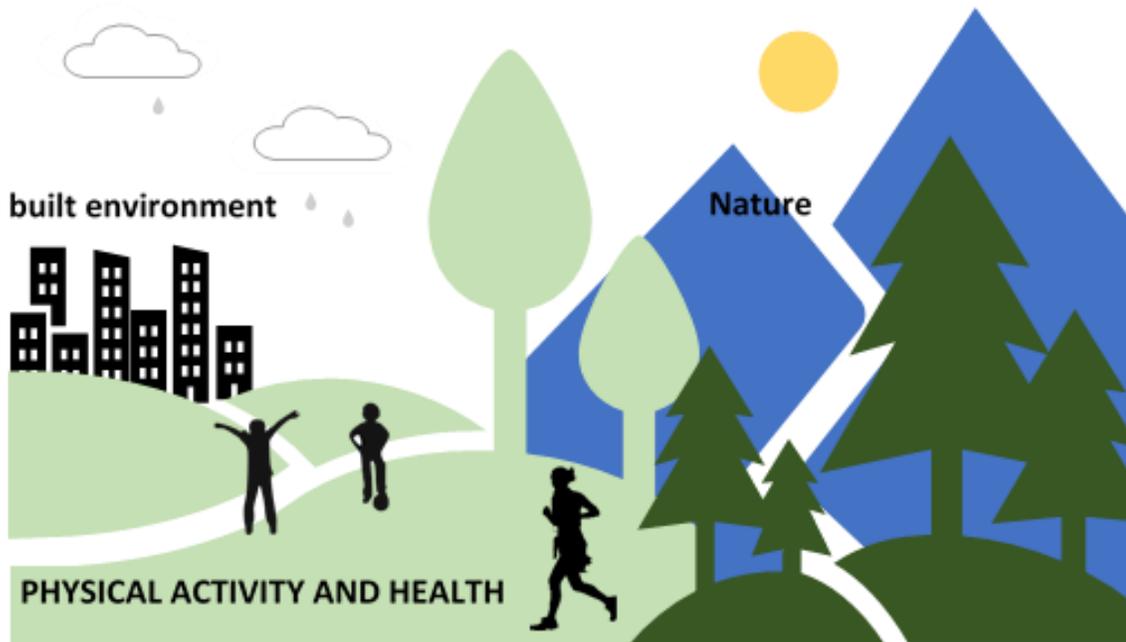
NFBC 1966 Residential environment?

Question for pregnant mothers (1965-1967):

- Domicile (municipality)
 - Population density: town, market borough, major village or other centre of population, out-of-the-way village
 - Has mother always lived in the same place of residence?
 - Previous place of residence
 - Distance to maternity clinic
 - Distance to neighbour
 - Distance to major village
 - Distance to medical office
- Later some questions about home environment, but no questions about wider residential environment.



Northern Finland Birth Cohort 1966



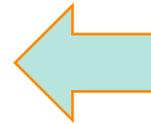
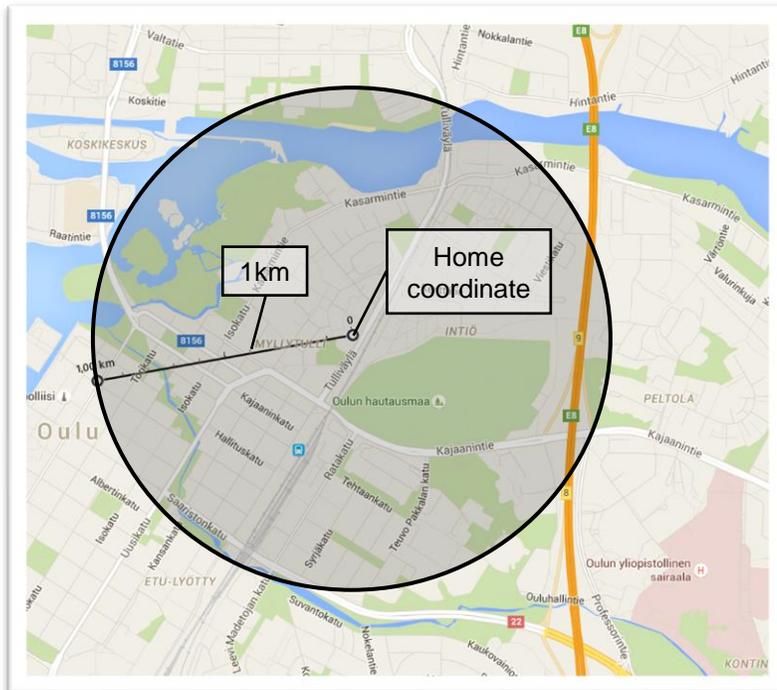
Home coordinates from 1966 to 2014 were asked from Digital and population data services agency

- All residential locations (coordinates) that belong to the interval of 1.1.1997-30.9.2014 have been selected from the data
- Geographical variables have been **calculated yearly**, so that all coordinate locations belonging to that year based on the beginning and ending dates of the residence in that coordinate location are linked with that same year's geographical data.
- Geographical variables are not in all cases available for every year, and in those cases the closest possible data is used (max ± 5 years, newer data if the time difference was the same for newer and older data)

Interest especially in physical activity



Northern Finland Birth Cohort 1966



- Time varying geographical variables within close residential area (Grid data of spatial structure and urban form (YKR), Digiroad, Corine, Lipas), for example:
- **Built environment**
 - Number and type of apartments
 - Number of different types of destinations
 - Number of intersections
 - Number of sports facilities
 - Land use
- **Natural environment**
 - Land use
 - Greenness, NDVI
 - Biodiversity and geodiversity
- **Social environment**
 - Population density
 - Socioeconomic variables



Northern Finland Birth Cohort 1966



Distance to

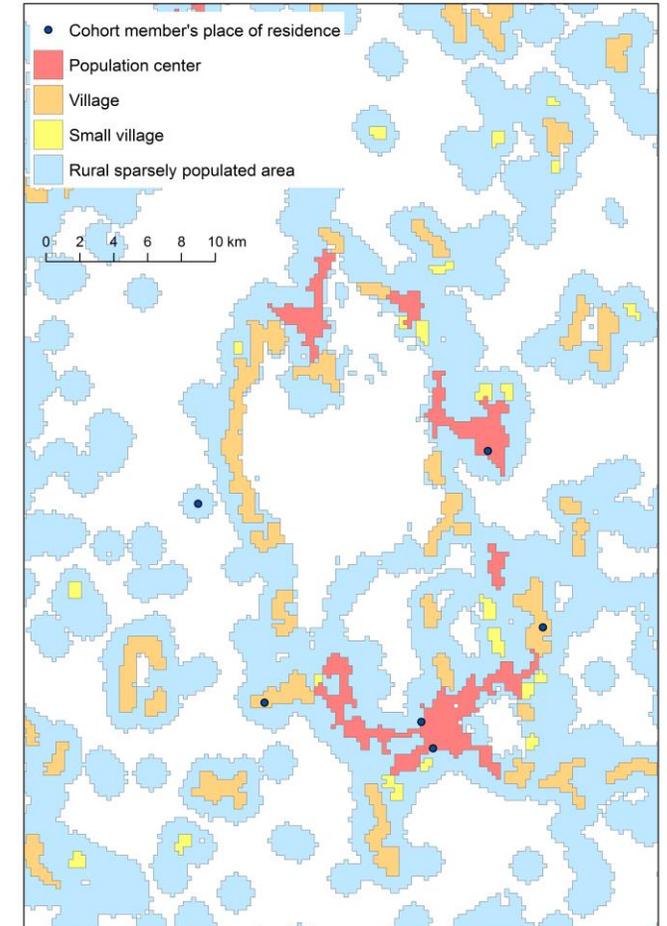
- local centre
- nearest shop
- nearest sports facility
- nearest green area

Regional divisions

- YKR Urban-rural classifications
- YKR Spatial structure: population centers, villages, sparsely populated areas
- YKR Urban zones

Municipal data

- Economic dependency ratio





Kärmeniemi et al. (2019) Residential relocation trajectories and neighborhood density, mixed land use and access networks as predictors of walking and bicycling in the Northern Finland Birth Cohort 1966. *International Journal of Behavioral Nutrition and Physical Activity* (2019) 16:88 <https://doi.org/10.1186/s12966-019-0856-8>

High density residential areas with good access networks have been associated with increased physical activity

Walkability and Self-reported regular walking and cycling

- Walkability was calculated for areas surrounding cohort members' homes for every year from 1997 to 2012 (from 31 to 46 years of age)
 - Population density, number of destinations, number of crossroads (YKR, Digiroad)
- With sequence analysis the study population was divided to different residential history groups (different relocation trajectories) according to walkability
- Relocation trajectories were used to explain the change in self-reported walking and cycling
- Increased neighborhood walkability was associated with increased regular walking and cycling: relocation trajectory from lower to highest walkability increased the odds of starting regular walking and cycling as compared to higher to lower walkability trajectory



Greenness in residential area has been associated with physical and mental well-being and physical activity

Greenness and accelerometry measured physical activity

- Greenness index (NDVI) was calculated for areas surrounding cohort members' homes at 46 years of age
 - Landsat 8 (L8) satellite images administrated by the USGS (United States Geological Survey) with less than 10% cloud cover were selected, and the months of June to July (2013–2016) were used in the calculation as they represent the greenest months in Finland's seasonal variation.
- Physical activity was measured with wrist-worn Polar Active Monitor accelerometers for two weeks
- The association between residential greenness and the amount of physical activity at different intensity levels was studied
- Residential greenness was positively associated with light physical activity at 46 years of age, especially among men



Both earlier residential environments and contemporary factors have been associated with population health

Long-time residence in different residential environments and changes in health

- Residential coordinates of NFBC1966 from 1997 to 2014 (from 31-year data collection to 46-year data collection), distinguishing those whose residential area has stayed the same or changed
- For example:



- Special interest in **physical activity**, but also **perceived health** and **subjective well-being**, **mental health (depression)** and **cardiovascular diseases**



Thank you!

