



Within the three Northern Dutch provinces, substantial regional differences exist regarding, for example, food patterns or disease prevalence and incidence. To realize a healthy vital region it is important to take these differences into account. The multiplicity and diversity of the Lifelines data, allows for interpretation at municipality and neighborhood level. We use pseudonimisation and encryption of the data and results are not to be stigmatising (group privacy). Both geocoding and health data are available at Lifelines, this can be of great potential for GEO health research.

## Which of the Lifelines data could contribute to scientific research on GEO-health?

### General

Lifelines has a large and broad collection of longitudinal data, making it possible to combine health data on e.g. lifestyle, general health conditions, with data from measurements, like blood pressure and electrocardiography and biomarkers from lab analyses.

### Municipal Population register

Lifelines is linked with the 'Basisregistratie Personen' (BRP), which is the Dutch municipal population register. In this register one can find every Dutch citizen's important life events as birth, death, marriage and divorce, and address changes. By linking the Lifelines participants with the BRP database, we keep our data up to date with reliable and historical data for addresses and moving dates.

## Example regional differences in food patterns

Dekker et al. (2017) showed that regional differences in food patterns exist, regardless of age and gender. More specifically, Dekker et al. (2017) considered four dietary patterns: the 'bread and cookies', 'snack', 'meat and alcohol', and 'vegetable, fruit and fish' pattern. Urbanization seems to be an important factor for clustering food patterns. Incorporating educational attainment and neighborhood income explained only part of the clustering. Therefore, they conclude that a sub-national regional approach to increase healthy eating might be needed.



## Geocoding

Geocoding is the process of finding associated geographic coordinates (e.g. latitude and longitude) from other geographic data, such as street addresses or ZIP codes (postal codes). Within Lifelines, geocoding is the process of linking Lifelines participant geographic data to geographic X and Y coordinates and GWB codes (Gemeente Wijk Buurt codes or City Neighborhood Area codes). Because Lifelines has the geocodes of its participants, additional information can be added to individual participants in order to answer additional GEO-health questions.

## Linkage opportunities

Lifelines data of individual participants can be linked to the same individuals from medical or institutional registries. Examples of registries that can currently be linked to Lifelines data are: Statistics Netherlands (CBS), the Dutch prescription medication database (IADB.nl), the Dutch pathology/anatomy archive (PALGA) and the Dutch perinatal registry (PERINED). In addition, environmental data (for example air quality, lists of local sports and retail facilities or workplace facilities in the Netherlands (LISA)) can be linked to individual participants via their residential postal code. Various other linkages are in preparation.

Additionally, other external data sources that use geocoding can be linked to Lifelines participant data. Please contact us to investigate the possibilities [research@lifelines.nl](mailto:research@lifelines.nl).

Note that data linkage must be performed via pseudonymized personal identifiers (name, address, birth date, postal code) by a trusted third party. Depending on the novelty and method of the required data linkage, a given project may require more or less time and effort to get started.

## Additional environmental data

As a result of several previous projects, Lifelines has also gathered additional environmental data: air pollution and noise exposure. The air pollution data is obtained from both the ESCAPE and Elapse Project in raster-format and was linked to individual participants using the geocodes of their home address(es). The noise exposure data was linked to Lifelines participants based on their geocodes as well, using the CNOSSOS-EU road traffic noise prediction model.



### air pollution

	BC (Black Carbon)	NO2 (nitrogen dioxide)	O3 annual (Ozone)	PM2.5 (particulate matter)
Mean:	1.2	21.5	64.3	14.8
Lowest:	0.6	8.2	38.3	7.9
Highest:	3.2	65.4	72.2	21.8



### road traffic noise

	Daytime (07-19h)	Evening (19-23h)	Night time (23-07h)
Mean:	56 dBA	52 dBA	47 dBA
Lowest:	51 dBA	47 dBA	42 dBA
Highest:	84 dBA	80 dBA	75 dBA

# Visualization of demographic data at baseline

## Residence participants

**Friesland**  
39%

**Groningen**  
31%

**Drenthe**  
28%

**Other**  
2%



### interactive map

Our interactive map displays baseline data on municipality level to provide some insights into GEO health already. (username: Lifelines, password: Maaktonderzoekmogelijk).

