« Synthetic population : a tool to forecast the future health needs in Belgium, at the municipality level. »

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1. Aim of the research

Forecast the future population’s health needs

Need of data:

- For static initial population
  → No exhaustive data
  → Privacy
  → Create a synthetic population of the individuals in Belgium

- For dynamical evolution
2. Pool of individuals

2.1. With basic demographics features
Pool of individuals

Data

National Register

Age
Gender
Municipality
Type of Household (HH)
Size of HH
Link with the head

CENSUS 2011 (scaled)
Add diploma to NR

Add status to NR (after IPF)
Number of desired and simulated individuals per education level, municipality, age and sex

Number of desired and simulated individuals per activity status, municipality, age and sex

Number of desired and simulated individuals per education level, activity status, age and sex
2. Pool of individuals

2.2. With the addition of health features

1. Identify pertinent variables to be added (illnesses: diabetes, Parkinson, chronic pain, BPCO and osteoporosis)

2. Data coming from the reimbursed medicines (Pharmanet), by sex, age and municipality

3. Add the illnesses following the data
3. Group the individuals into households

Consider all individuals

- Age
- Gender
- Municipality
- Education level
- Activity status
- Type of Household (HH)
- Size of HH
- Link with the head

Group individuals into households
Create subsets

Group individuals into households

Consider all individuals

Age
Gender
Municipality
Education level
Activity status

Type of Household (HH)
Size of HH
Link with the head
Married couples
With children

Size = 4

Head 1 (W)
Head 2 (M)
Head 3 (M)

Child 1
Child 2
Child 3
Child 4
Child 5
Child 6

Conjoint 1 (W)
Conjoint 2 (M)
Conjoint 3 (W)

Size = 3

...
Consider all individuals

- Age
- Gender
- Municipality
- Education level
- Activity status
  - Type of Household (HH)
  - Size of HH
  - Link with the head

Group individuals into households

Create subsets

Age differences in the couples

Age differences parents-children

Useful data?
Simulated annealing (for Namur):

From a random basis, try exchanges:
- If better: keep new configuration
- If worst: keep new configuration with
  \[ p = \exp(-\text{Error}/\text{Temperature}(i)) \]
Consider the distribution directly for Belgium (fitness = 1)
Age distribution inside couples
Consider the distribution directly for Belgium (fitness = 1)
Age distribution head - child

Distribution d'âges des enfants par rapport à l'âge du chef
Proportions of individuals non assigned to a household

Worst: Baarle-Hertog (0.41%) et Martelange (0.26%)
Proportions of individuals with wrong size of HH. Worst: Aubange (1%)
4. Perspectives

1. Add the dynamical evolution: birth, aging, death, marriages, divorces, moves,...

2. Conclude for the future health needs in 2030
5. Conclusion

1. Population as close as possible to the real population.

2. Containing health characteristics.

3. No privacy law problems.

4. Grouped into households.

5. Applicable in a lot of fields.