New concept proposal
Home Address, Swiss Socio Economic Position

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1   Rationale

The concept Home Address was built to allow generic data collection according person's residence (e.g. city, country) or with the residency associated information influencing person's health (e.g. Swiss Socio-Economic Position, SEP)

The socio-economic characteristics of a person are associated with a variety of health outcomes e.g., growth, disease, mortality. If individual socio-economic data are missing, area-based measures of socio-economic positions can be used as a proxy. This is especially interesting when investigating clinical routine data from hospitals, where socio-economic characteristics (e.g., salary, education, housing) are not captured.

The Swiss Socio-Economic Position (Swiss-SEP) is an area-based measure of socio-economic data used in Switzerland based on data of the Swiss Federal Statistical Office (SFSO). The Swiss SEP describes 1.54 million neighbourhoods of approximately the 50 closest households and is centred on residential buildings. Neighbourhoods are characterised by four domains: income (approximated by median rent per square metre), education (proportion of households with a person with primary education or less), employment (proportion of households with person working in unskilled occupations), and housing conditions (crowding - the mean number of persons per room as a proxy for economic resources). These four domains are combined using principal component analysis to form a score standardised to a range of 0 (lowest SEP) to 100 (highest SEP).

Currently, three versions of the Swiss-SEP are available:

- Version 1.0: 'old', based on the 2012 version with data from the Census 2000 [1, 2],
- Version 2.0: 'new' version based on combined micro censuses 2012-2015 [3], and
- Version 3.0:'hybrid' combining version 1 and 2, updating values only for buildings constructed after 2000) [3].

Full details about the data preparation, exclusion and inclusion criteria, and the development of the latest new (Swiss-SEP 2) and hybrid version of the Swiss-SEP (Swiss-SEP 3) are described in Panczak et al.[3].

2 Comparison to other standards/data models

2.1 2.1 SNOMED CT
In SNOMED CT, there is a concept *Legal, financial, employment and socioeconomic history detail* SNOMED CT: 302148006 | Legal, financial, employment and socioeconomic history detail (observable entity) | within the observable entity hierarchy. The parent concept of Legal, financial, employment and socioeconomic history detail is observable entity 160476009 | Social / personal history observable (observable entity) |.

2.2 NCI Thesaurus
The NCI provides a definition for socio-economic position as follows: "A characterization or classification of an individual that takes into account economics, demographics, and social interactions, used to stratify individual behaviours within a society or culture." Code for the concept: C198364. Source: NCI Thesaurus (nih.gov)

3 Concept information

3.1 Home Address

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for ComposedOf
Concept	**Home Address**	**permanent place of residence of an individual**	**Home Address**	**permanent place of residence of an individual**				**SNOMED CT: 397635003 | Address (observable entity) |**	
composedOf	start datetime	datetime at which the concept started	start datetime	start datetime of the address	temporal				0:1
composedOf	end datetime	datetime at which the concept ended	end datetime	stop datetime of the address	temporal				0:1
composed of	country	country associated to the concept	country	country of the home address (e.g. Switzerland or Germany)	Country				0:1
composedOf	swiss socio economic position	area-based measure of socio-economic position (SEP) for Switzerland	swiss socio economic position	area-based measure of socio-economic position (SEP) for Switzerland	Swiss Socio Economic Position				1:n

A project of

SAMW ASSM
Schweizerische Akademie der Medizinischen Wissenschaften
Académie Suisse des Sciences Médicales
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SIB
Swiss Institute of Bioinformatics

SIB | Swiss Institute of Bioinformatics
PHI | Personalized Health Informatics Group
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General Concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Home Address	-	1:1	1:1	1:1

3.2   Swiss Socio-Economic Position (SEP)

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for ComposedOf
Concept	Swiss Socio Economic Position	characterization or classification of the Swiss position in a neighbourhood of an individual that takes into account income, education, occupation, and housing conditions	Swiss Socio-Economic Position	characterization or classification of the Swiss position in a neighbourhood of an individual that takes into account income, education, occupation, and housing conditions					
composedOf	value	value of the concept	Swiss SEP value	value of Swiss socio-economic position	quantitative				0:1
composedOf	distance	distance related to the concept	distance to the calculated Swiss SEP	distance between the coordinates of the coded home address of the individual and the coordinates of the nearest Swiss-SEP value	Quantity	UCUM	unit -> code restricted to: m		0:1

composedOf	version	version of the concept value or code	Swiss SEP version	version of the Swiss-SEP	string				0:1

General Concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Swiss Socio-Economic Position	-	-	-	-

4   Impact on the SPHN Dataset

The Swiss SEP is a new concept proposal. The SEP is based on the Home address. In addition to the SEP, several other information (e.g. Country, Zip code) related to the home address might be relevant for the researcher. Therefore, it was decided to nest the concept *SEP* in a more broad "overall" concept *Home address.*

5   Discussion

The concept *Home Address* is a "mother concept" allowing further data collection. For SwissPedHealth the concept *Swiss Socio-Economic Position (SEP)* is of relevance.
The person's socioeconomic position is based on a person's address, which will be converted in the clinical data warehouse (CDW) in the geocode and the geocode will then be converted in the non-identifying SEP (for detailed information on data conversion please refer to 5.1).
The geocode of the individual's home address might be in some cases not exactly matched with the SEP, therefore the nearest Swiss-SEP value can be used and the distance between the geocode of the home address and the used SEP is captured to allow quality assessment.
Because there exist three versions of the Swiss-SEP, a single home address can have up to 3 instances of the Swiss-SEP composedOf. Therefore, the cardinality of the Swiss-SEP composedOf is 1:n.

5.1 Additional explanation

The value of the composedOf "Swiss-SEP value" is quantitative and i 0 to 100 (integer).

The information represented by the composedOF "version2 refers to: Version1.0, Version 2.0, Version 3.0

5.2 Conversion of home address to Swiss-SEP

The conversion of a person's home address to the Swiss-SEP will be done in the CDWs.

There are two datasets that are needed to calculate a Swiss-SEP value for a person's home address.
  (1) The Swiss-SEP dataset that contains Swiss-SEP values and coordinates/geocodes where this Swiss-SEP value is located. The Swiss-SEP dataset is available free of charge for research purposes. Access to the dataset is possible after signing a contract with the Swiss National Cohort (SNC); «Datenlieferungsvertrag» [4]**.**
  (2) A dataset of all addresses in Switzerland and corresponding coordinates/geocodes. This dataset is openly available online from the Federal Statistical Office (FSO, https://www.housing-stat.ch/de/madd/public.html).

At ISPM the SwissPedHealth team already combined the two datasets into a reference dataset, to obtain the nearest Swiss-SEP value for every address (Swiss-SEP value and version), as well as the distance between the coordinates of the address and the coordinates of the nearest Swiss-SEP value (Swiss-SEP distance).

The CDWs will then have to find a person's home address in the reference dataset provided by the ISPM team, to obtain the corresponding Swiss-SEP (value, version, distance). This can be done with an R or python script provided by the ISPM team. This script will employ a string comparison method (e.g.,

Levenshtein distance) between the person's home address and the addresses in the reference dataset to find the best matching reference address.

To minimize the risk of identifying information, we will report the Swiss-SEP value as an integer from 0 to 100 without decimals. Similarly, we will report the Swiss-SEP distance as an integer in meters, without decimals.

6 Example

Home Address

    start datetime:23.10.2021

    end datetime: 25.09.2023

    country (Country):

        code:

            identifier: 223642007

            name: Switzerland (geographic location)

            coding system and version: SNOMED-CT-2023-07-31

    swiss socio economic position (Swiss Socio Economic Position)

Swiss Socio Economic Position

    value: 65

    distance (Quantity):

        value: 10

        unit: m

    version: 3.0

7 References

1.   Panczak, R., et al., *A Swiss neighbourhood index of socioeconomic position: development and association with mortality.* J Epidemiol Community Health, 2012. **66**(12): p. 1129-36.
2.   Federal Statistical Office (FSO). *Population and buildings censuses 1970, 1980, 1990, 2000.* 18.08.2023]; Available from: https://www.bfs.admin.ch/bfs/en/home/services/geostat/swiss-federal-statistics-geodata/population-buildings-dwellings-persons/population-buildings-censuses-1970-1980-1990-2000.html.
3.   Panczak, R., et al., *The Swiss neighbourhood index of socioeconomic position: update and re-validation.* Swiss Med Wkly, 2023. **153**: p. 40028.
4.   Bern Open Repository and Information System. *Request a restricted Research Data Item: Swiss Neighbourhood Index of Socioeconomic Position (Swiss-SEP).* 18.08.2023]; Available from: https://boris-portal.unibe.ch/request-item?handle=20.500.12422/148&bitstream-id=604.