SNOCLASS : A Belgian terminology project for mapping relevant SNOMED CT concepts to WHO Family of Classifications in 3 domains

Selecting relevant SNOMED CT concepts to consider for mapping to three classifications using hierarchy (semantic) tags

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Conflict of interest statement

No conflict of interest for both presenters

Overview

Problem statement and aim of the project

Presentation of the project team

Introduction on mapping ; from what to what ?

Description of the 3 classifications

Methodological approach and preliminary results

Timeframe for further work

Problem statement

How can SNOMED CT be implemented

with the support of the clinicians

by respecting the existence of the classifications

in their relevant domains?

Aim of the project

- To explore the appropriate way

  to map a reference terminology (SNOMED CT)

  to 3 specific domain classifications (ICPC-3, ICHI, ICF)

- To provide

  a significant sample of matched SCT concepts

  for each of the 3 domains

  in a standardized format

- To estimate the effort to complete the task

Presentation of the project team

(Ghent University, Faculty of Medicine and Health Sciences)

For the International Classification of Primary Care (ICPC-3)

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Research Unit for Occupational Therapy

Dominique Van de Velde, Ellen Cruyt, Stijn De Baets

Coordination

Robert Vander Stichele, senior research coordinator

Joseph Roumier, IT and semantic web support

Introduction
to the mapping approach
in this project

Directionality

SNOMED International

(370.932 concepts)

ICF   (1.587 codes)

ICPC-3 (1.623 codes)

ICHI   (5.338 codes*)

*Interventions on Body Systems or functions

Mapping between conceptual systems

Classifications

ICF

Reference Terminology

Snomed-CT

ICPC-3

ICHI
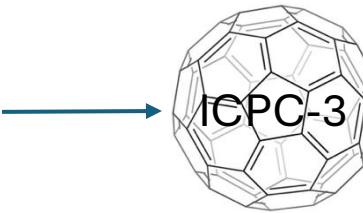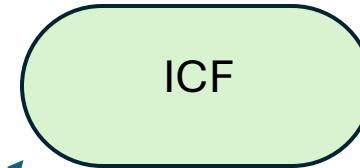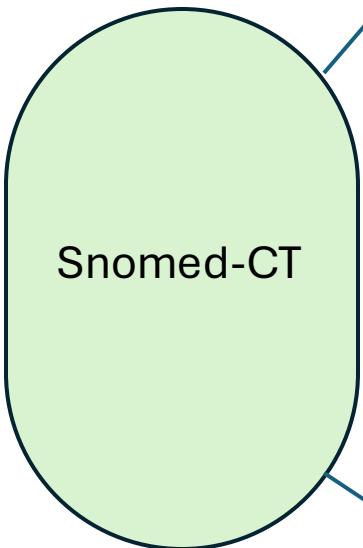
Language-independent maps

Difference between a reference terminology and a classification

SNOMED CT

A reference terminology for clinical practice

Comprehensive : 370.000+ medical concepts

Poly-hierarchy

Strong ontological structuring
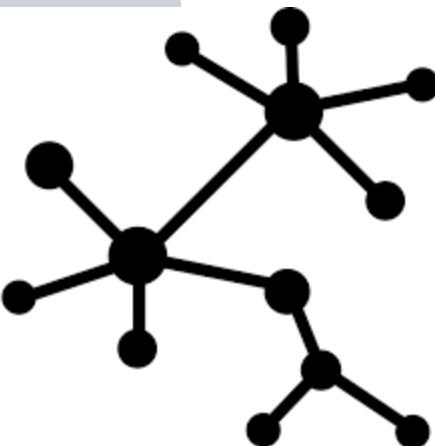
Classification

- Much smaller
- Mutual exclusiveness and exhaustiveness
- Simple taxonomic structure
- StemCodes
 - Inclusions

StemCodes
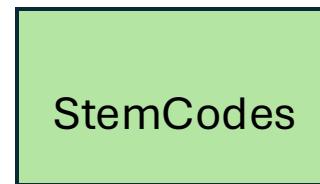
Inclusions

Description
of the 3 classifications

ICPC-3 Classification

Fourteen chapters represent the localization of the problem and / or disease on a body or body-system level, the **Chapters B to W**
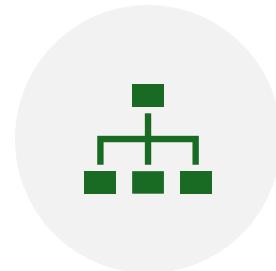
**Chapters A to W** are subdivided into two Components: **S and D**

**S for Symptoms, Complaints and abnormal findings**

D for Diagnoses and Diseases

General reasons for visit
AF01 Procreative management
  AF01,00 Wanting children
AF02 Oral contraception
AF03 Intrauterine contraception
AF04 Post-coital contraception
  AF04,00 Morning after pill method of contraception
  AF04,01 Postcoital intrauterine contraceptive device fitted
AF05 Other specified contraception
  AF05,00 Contraceptive diaphragm (pessarium occlusivum) device
  AF05,01 Depot contraception
  AF05,02 Sheath contraception, condom
AF06 Sterilization
AF99 Other specified family planning

AG01 General examination and investigation of persons without complaint or reported diagnosis
AG02 Other specified general examinations and investigations of persons without complaint or reported diagnosis
AG03 Examination and encounter for certification purposes
AG04 Routine general health check-up of defined subpopulation
AG99 Other specified general and routine examinations

AI01 Introduction to practice and health provider
AI02 Patient treatment and care preferences
AI03 Patient preferences about end of life care
AI99 Other specified introduction and patient treatment preferences

AP01 Special screening examination for neoplasms
  AP01,00 Special screening examination for neoplasm of breast
  AP01,01 Special screening examination for neoplasm of cervix
  AP01,02 Special screening examination for neoplasm of colon and rectum
  AP01,03 Special screening examination for neoplasm of lung
  AP01,04 Special screening examination for neoplasm of prostate
  AP01,05 Special screening examination for neoplasm of skin
AP10 Special screening examination for infectious and parasitic diseases
  AP10,00 Special screening for infections with a predominantly sexual mode of transmission
AP15 Special screening examination for diabetes mellitus
AP16 Special screening examination for cardiovascular disorders
AP20 Encounter for immunisation
AP21 Encounter for immunisation against influenza
AP22 Encounter for immunisation against COVID-19
AP40 Reasons for visit related to lifestyle
AP45 Persons encountering health services for other counselling and medical advice
AP50 Contact with and exposure to communicable diseases
AP60 Potential health hazards related to personal history
AP65 Potential health hazards related to family history
  AP65,00 Family history of diabetes
  AP65,01 Family history of ischaemic heart disease and other diseases of circulatory system
  AP65,04 Family history of hypercholesterolaemia
  AP65,06 Use of DES by mother
AP66 Potential health hazards related to family history of cancer
  AP66,00 Family history of breast cancer
  AP66,01 Family history of colon cancer
  AP66,02 Family history of ovary cancer
AP70 Potential health hazards related to public health

AP80 Asymptomatic carrier
  AP80,00 Carrier of chromosome disorder
  AP80,01 Hepatitis B carrier
  AP80,02 Carrier, risk for environment or children
  AP80,03 Carrier, risk for him-, or herself
  AP80,04 Carrier of G6PD
  AP80,05 Carrier of sickle cell
  AP80,06 Carrier of thalassemia
AP99 Other specified prevention and case finding

AQ01 Health promotion related to reproductive and sexual health
AQ02 Health promotion related to growth, development and ageing
AQ03 Health promotion related to prevention of injury
AQ04 Health promotion related to prevention of violence
AQ05 Health promotion related to substance abuse
AQ99 Other specified health promotion

AR01 Encounter related to presence of devices, implants or grafts
  AR01,00 Presence of pacemaker or implantable cardioverter defibrillator (ICD)pacemaker
AR02 Encounter related to presence of artificial opening
  AR02,00 Living with a stoma
AR03 Encounter related to presence of transplanted organ or tissue
  AR03,00 Status after transplant
AR04 Encounter related to postponement of menstruation
AR99 Other specified reasons for visit

General
AS01 General pain in multiple sites
AS02 Chills
AS03 Fever
AS04 General weakness or tiredness
AS05 Postviral fatigue
  AS05,00 Chronic fatigue syndrome
AS06 Feeling ill
AS07 Fainting
AS08 Frailty
AS09 Swelling and generalized edema
AS10 Sweating problem
  AS10,00 Localised hyperhidrosis
  AS10,01 Night sweats
AS11 Bleeding
AS12 Chest pain
AS13 Irritable infant
AS14 Fall of unknown origin
AS50 Other specified abnormal result investigation
  AS50,00 Elevated blood glucose level
  AS50,01 Subclinical hypothyroidism
  AS50,02 Subclinical hyperthyroidism
AS52 Shock
AS53 Coma
AS90 Concern or fear of disease
AS91 Concern or fear of medical treatment
AS92 Concern about appearance
AS99 Other specified general symptoms, complaints and abnormal findings
  AS99,00 Cold extremities

AD01 Measles
AD02 Chickenpox
AD03 Rubella
AD04 Infectious mononucleosis
AD13 Other specified and unknown viral exanthems
  AD13,00 Erythema infectiosum (fifth disease)
  AD13,01 Exanthema subitum (6th disease/roseola infantum)
  AD13,02 Hand foot and mouth disease
AD14 Other specified and unknown viral diseases
  AD14,00 Chikungunya fever
  AD14,01 Dengue fever
  AD14,02 Dengue haemorrhagic fever
  AD14,03 Ebola virus disease
  AD14,04 Hantavirus disease
  AD14,05 Lassa fever
  AD14,06 Rabies
  AD14,07 Yellow fever
  AD14,08 Zika virus disease
AD15 Tuberculosis
AD16 Malaria
AD17 Leishmaniasis
  AD17,00 Cutaneous leishmaniasis
  AD17,01 Mucocutaneous leishmaniasis
  AD17,02 Visceral leishmaniasis
AD23 Sepsis
AD24 Other specified and unknown infectious diseases
  AD24,00 African trypanosomiasis
  AD24,01 Chagas disease (South American trypanosomiasis)
  AD24,02 Filariasis
  AD24,03 Infection caused by Onchocerca volvulus
  AD24,05 Lyme disease
  AD24,06 Leprosy (Hansen's disease)
  AD24,07 Loiasis
  AD24,08 Lymphatic filariasis
 AD24,09 Scarlet fever

AD25 Malignant ... neoplasms
AD26 Other ... neoplasms
AD35 Multiple ...
AD36 Other spec...
AD37 Secondary e...
AD40 Poisoning by ...
AD41 Adverse effect of ...
  AD41,00 Drug allerg...
  AD41,01 Drug induced ...
  AD41,02 Spotting using ...
AD42 Complication of medica...
  AD42,00 Adverse effect of ...
  AD42,01 Dehiscence episio...
AD43 Side-effect of prosthetic d...
AD44 Toxic effect of non-medicin...
  AD44,00 Poisoning caused by ...
AD45 Adverse effect of physical fac...
  AD45,00 Chilblains (perniones)
  AD45,01 Heat stroke and sunstrok...
  AD45,02 Motion sickness
AD46 Other specified and unknown all... reaction
  AD46,00 Anaphylactic shock
  AD46,01 Angioneurotic oedema
  AD46,02 Cow's milk protein allergy
AD55 Congenital anomaly, other specified
  AD55,00 Complete trisomy 21 syndrome (... syndrome)
AD65 Premature newborn
AD66 Other specified and unknown perinatal...
AD95 Perinatal mortality
  AD95,00 Newborn death
  AD95,01 Undelivered in utero foetal death
AD96 Death
  AD96,00 Natural death
  AD96,01 Unnatural death
AD99 Other specified or unknown general disease... conditions of unspecified site

Blood
BS01 Lymph gland(s) symptom or complaint
BS50 Splenomegaly
BS51 Unexplained changes in white blood cells
BS52 Elevated erythrocyte sedimentation rate
BS90 Concern or fear of disease of blood, blood-form... organs and immune system
BS99 Other specified symptoms, complaints or abnor... findings of blood, blood-forming organs and immune system

BD01 Lymphadenitis acute
BD02 Other specified or unknown lymphadenitis
BD03 Asymptomatic HIV-infection
BD04 Symptomatic HIV-infection/AIDS
BD25 Malignant neoplasm of blood, blood-forming organ... and immune system
  BD25,00 Hodgkin lymphoma
  BD25,01 Malignant lymphoma, other classified
  BD25,02 Leukaemia
  BD25,03 Plasma cell myeloma
  BD25,04 Burkitt lymphoma
BD26 Benign, uncertain or in-situ neoplasm of blood, blood-forming organs and immune system
BD35 Injury of blood, blood-forming organs and immune system
  BD35,00 Traumatic ruptured spleen
BD55 Congenital anomaly of blood, blood-forming organ... and immune system
BD65 Hereditary haemolytic anaemia
  BD65,00 Haemolytic anaemia due to glucose-6-phosphate dehydrogenase deficiency
  BD65,01 Sickle cell disorders or other haemoglobinopathies
  BD65,02 Thalassaemias
BD66 Iron deficiency anaemia
BD67 Vitamin B12 anaemia or folate deficiency anaemia
  BD67,00 Folate deficiency anaemia
  BD67,01 Megaloblastic anaemia due to vitamin B... deficiency
BD77 Other specified and unknown anaemias
  BD77,00 Severe anaemia
BD78 Coagulation defect
  BD78,00 Hereditary factor VIII deficiency
  BD78,01 Hereditary factor IX deficiency
  BD78,02 Immune thrombocytopenic purpura
  BD78,03 Thrombophilia
BD99 Other specified or unknown blood, blood... organs, immune system diagnoses or dis...
  BD99,00 Immunodeficiency
  BD99,01 Sarcoidosis

Digestive system
DS01 General abdominal pain
DS02 Epigastric pain
DS03 Heartburn
DS04 Rectal or anal pain
DS05 Perianal itching

RS07 - Cough

Symptom

Chapter R – Respiratory system

Diagnosis

RD09 - Pneumonia

ICF-classification

ICF linearisation

- WHOFIC
- ICF Category
- Activities and participation
- Mobility
- Walking and moving
- d465 Moving around using equipment

ICHI classification

ICHI linearization

Mapping approach

Taxonomy of valid matchings from SNOMED CT to classifications (ICHI, ICF, ICPC-3)
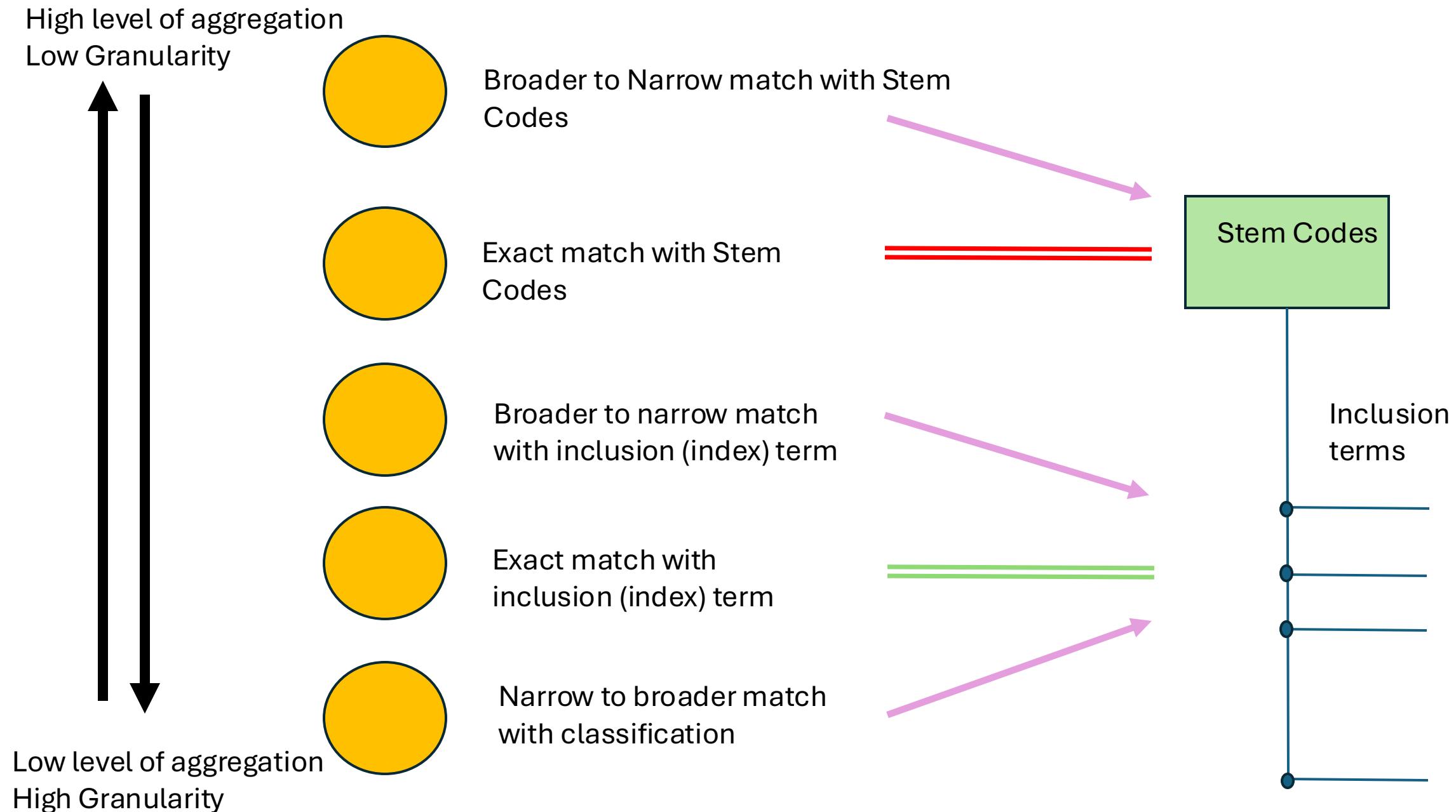
First selection of relevant SCT codes for each classification by choosing the relevant SemanticTags

Experts from the 3 domains selected from the 19 SCT SemanticTags the relevant tags for each domain.

Note: SemanticTags have no definition.

They alleviate ambiguity for concepts with identical FSN.

Selecting SCT concepts relevant for the domains

Starting point: 370.931 active SCT concepts
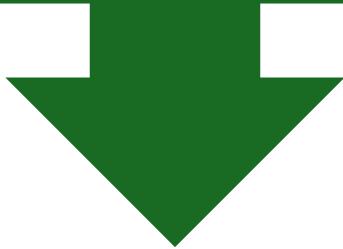
Selection of potentially relevant concepts by SemanticTags per domain

| ICHI: (procedure) and (regime/therapy) → 59.313 (~16%) | ICF: many → 196.867 (or 200.358) (~53%) | ICPC-3: many → 258.926 (or 263.096) (~70%) |

Further selection of relevant SCT concepts per domain by choosing a core sample for this project

ICPC-3	ICF	ICHI
• **Belgian Bilingual Biclassified Thesaurus to SCT Project**	• SCT Refset: **Activity of Daily Living** related to physical function findings	• National Library of Medicine **ICD-9-CM Procedure** Codes to SNOMED CT Map
• **4.160** SCT concepts	• **1.108** SCT concepts	• **2.528** SCT concepts

Methodology
for each of the classifications and preliminary results

ICPC-3 source set - The Belgian Bilingual Biclassified Thesaurus (3BT)
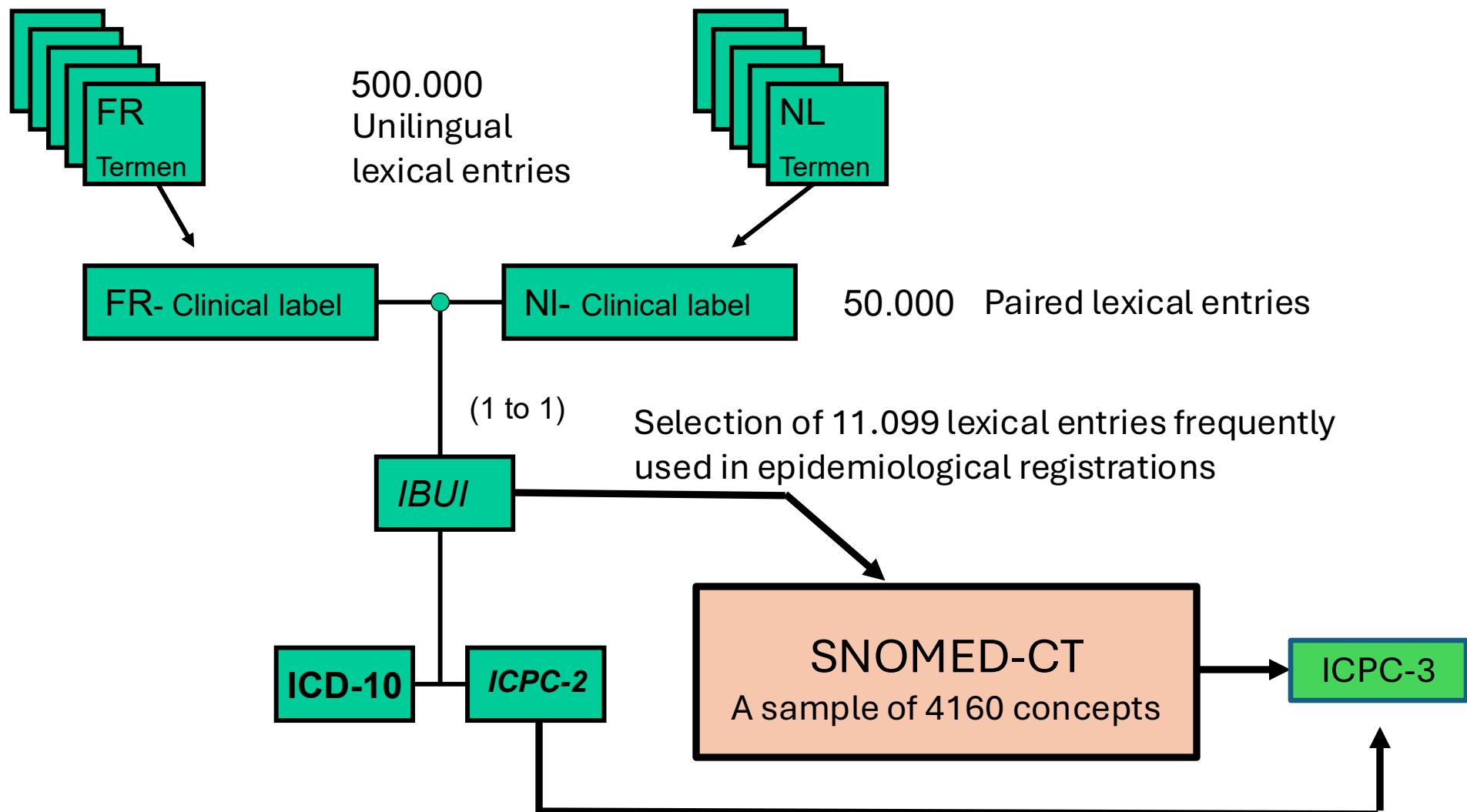
Results ICPC-3
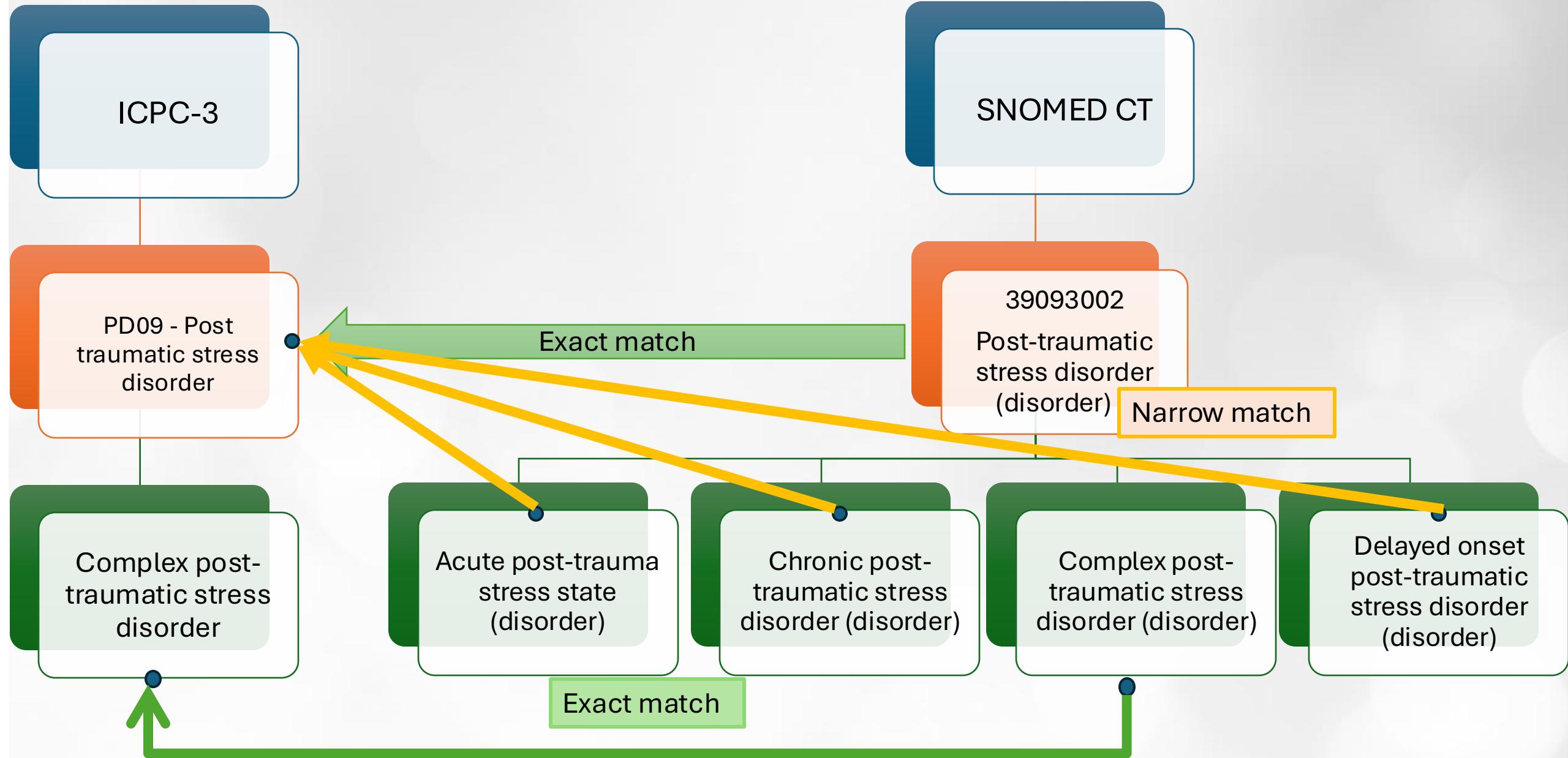
ICF methodology and preliminary results

- Starting from the UK Activities of Daily Living (ADL) core set (N=1.108)

- Trying out several approaches to mapping to the codes of ICF
  - String search
  - Fuzzy search
  - Business rules

- Acknowledging that the mapping from SCT to ICF is not straightforward
  - SCT often precoordinates its functionality concepts, while ICF has activities, modulated by qualifiers (capacity and performance)

- Hence, preparatory work was needed to parse the Precoordinated SCT functionality concepts into activities and capacity or performance qualifiers.

- This allowed to solve the alignment of most of the ADL SCT core set codes with activities+qualifier

Results ICF

Examples;
SCT-concepts

Does not ride a bicycle (finding) | SCTID:
300649009
Difficulty performing gardening activities (finding)
SCTID: 300754006
Difficulty walking (finding) |
SCTID: 719232003

ICHI activities with qualifiers

Qualifier mapping	Subject mapping
Does not	Ride a bicycle
Difficulty performing	Gardening activities
Able with difficulty	To walk

See e-poster !

More details to discuss

ICHI: Automated lexical matches between SCT Fully Specified Name (FSN) and ICHI stem code labels with Whoosh Python library = 'fuzzy match'

- Starting with Exact lexical string matches

- Expanding with "Fuzzy Matches" with decreasing probability of match

- Using AND approaches and OR approaches for multi component terms

- Setting a lower limit of probability score to exclude unlikely matches

- Manual checking by human expert

Source and Target Size per domain
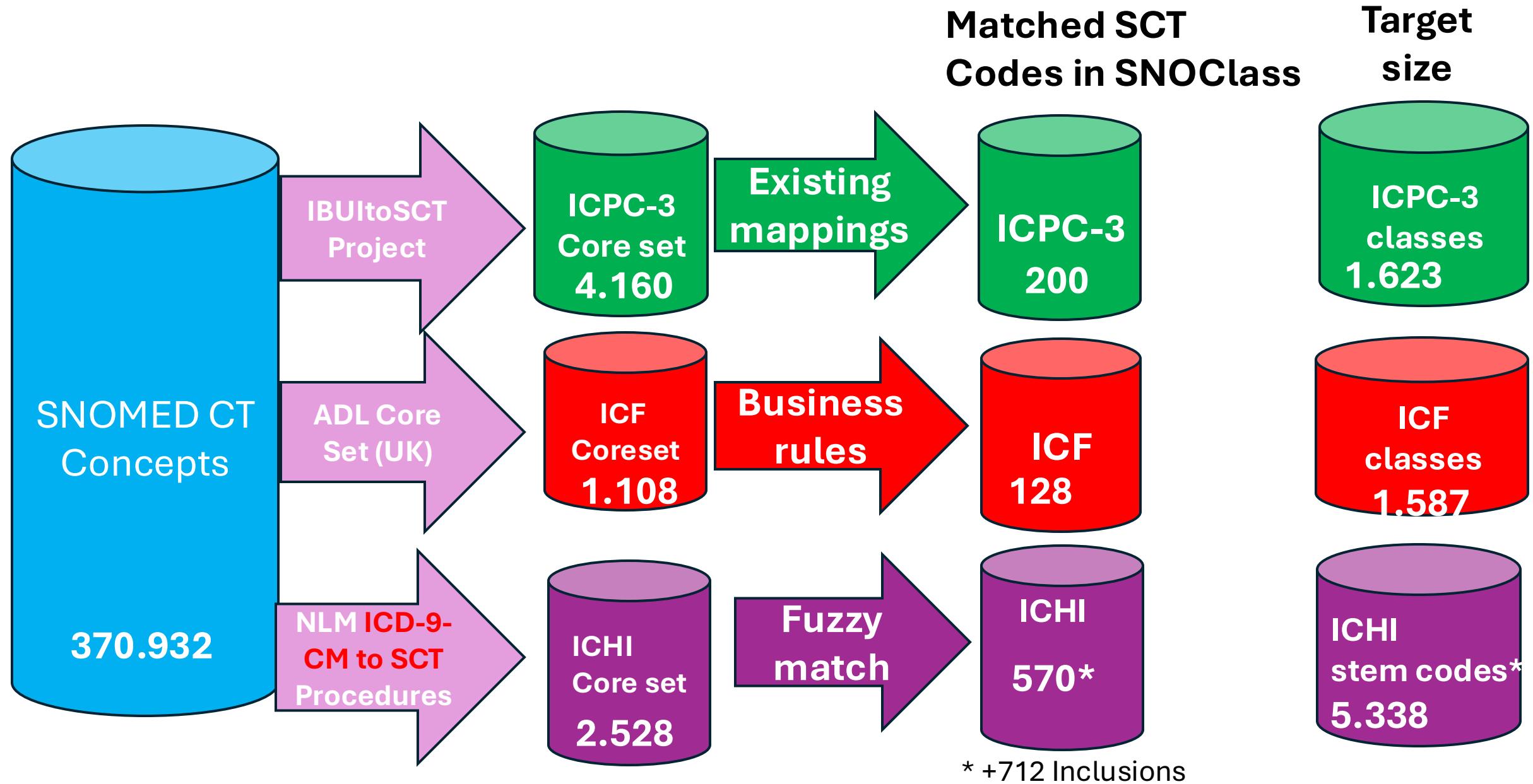
Simple Standard for Sharing Ontological Mappings (SSSOM) output

Subject ID and Object ID: source and target ontology terms

Predicate ID: relationship type (e.g., exact, broader, or narrower)

Justification: method used (e.g., lexical match or manual curation)

Provenance: origin of the mapping (contributor, creation date, and mapping tool used)

Nicolas Matentzoglu, et al, *Database*, 2022, 1-14

Timeframe of the

SNOClass Project Results

Timeframe for SNOClass project

2025

Upstart

Development of methodology

First Exemplary core sets matched

2026

Initiation of the

completion of the work

Thank you for your attention

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SNOClass

MAPPING SNOMED CT TO ICPC-3, ICF AND ICHI

https://snoclass.be