



# CIHI's Population Grouping Methodology 1.4

Overview and Outputs, 2023



Canadian Institute  
for Health Information

Institut canadien  
d'information sur la santé

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ISBN 978-1-77479-224-7 (PDF)

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How to cite this document:

Canadian Institute for Health Information. *CIHI's Population Grouping Methodology 1.4 — Overview and Outputs, 2023*. Ottawa, ON: CIHI; 2023.

Cette publication est aussi disponible en français sous le titre *Méthodologie de regroupement de la population de l'ICIS 1.4 — aperçu et extraits, 2023*.

ISBN 978-1-77479-225-4 (PDF)

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# Overview

The Population Grouping Methodology (POP Grouper) was developed by the Canadian Institute for Health Information (CIHI) to help meet the needs of Canada's health care systems.

This document provides an overview of the POP Grouper v1.4 and its clinical and predictive outputs. For more information, including how to access the grouper, please contact CIHI's Case Mix team at [casemix@cihi.ca](mailto:casemix@cihi.ca).

## What is the POP Grouper?

The POP Grouper is a methodology that uses a case-mix classification to profile each person in the population using person-level clinical information. This case-mix classification is then used to assign predictive indicators to each person. All persons in the population over a given time period, including healthy persons and persons who have not used the health system, are represented in the methodology.

The POP Grouper release consists of methodology notes, computer software that applies the methodology, a user guide for running the computer software and a licence agreement outlining how the software can be used. The POP Grouper is available for licensing to jurisdictional and regional ministries of health, health quality councils and research organizations, as well as other organizations.

## What does the POP Grouper do?

The POP Grouper builds clinical and demographic profiles for each person in a population. These profiles help predict the population's health care needs and costs. The POP Grouper can be used to

- Profile the overall health of the population;
- Monitor population health and diseases;
- Predict future health care costs;
- Predict future use of health services;
- Explain variations in health care resource use;
- Identify high-cost users;
- Explore multi-morbidity; and
- Allow for meaningful comparisons of cohorts across jurisdictions.

## What is needed to use the POP Grouper?

The following items are required to be able to use the POP Grouper:

- A complete list of all individuals residing in the population boundary of interest:
  - All residents with a valid health care number who are eligible to receive publicly funded health services (often referred to as “person-level insured persons data”)
- The person-level clinical and administrative data on health care services listed in the table below
- Statistical Analysis System (SAS) software
- CIHI POP Grouper licence
- CIHI POP Grouper software written in SAS

**Table** Data inputs for POP Grouper

Source of clinical data	CIHI clinical database	Clinical classification
Physician care	Patient-Level Physician Billing Repository, Primary Health Care — Alliance for Healthier Communities Database	ICD-9, ICD-10
Inpatient stays	Discharge Abstract Database	ICD-10-CA
Hospital inpatient mental health*	Ontario Mental Health Reporting System, Discharge Abstract Database	RAI-MH, ICD-9-CM, ICD-10-CM, DSM-5-TR, ICD-10-CA
Day surgeries	Discharge Abstract Database, National Ambulatory Care Reporting System	ICD-10-CA
Hospital clinic visits	National Ambulatory Care Reporting System	ICD-10-CA
Emergency department visits	National Ambulatory Care Reporting System	ICD-10-CA
Long-term care facilities	Continuing Care Reporting System, Integrated interRAI Reporting System	RAI-MDS 2.0, interRAI LTCF
Home care services	Home Care Reporting System, Integrated interRAI Reporting System	RAI-HC, interRAI HC

### Notes

\* Child and youth inpatient stays for mental illness in Ontario are included in the Discharge Abstract Database. Adult inpatient stays for mental illness in Ontario are included in the Ontario Mental Health Reporting System.

ICD-9: *International Classification of Diseases, Ninth Revision.*

ICD-10: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision.*

ICD-10-CA: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada.*

RAI-MH: Resident Assessment Instrument–Mental Health.

ICD-9-CM: *International Classification of Diseases, Ninth Revision, Clinical Modification.*

ICD-10-CM: *International Classification of Diseases, Tenth Revision, Clinical Modification.*

DSM-5-TR: *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision.*

RAI-MDS 2.0: Resident Assessment Instrument–Minimum Data Set 2.0.

interRAI LTCF: interRAI Long-Term Care Facilities.

RAI-HC: Resident Assessment Instrument–Home Care.

interRAI HC: interRAI Home Care.

### Source

Population Grouping Methodology, 2023, Canadian Institute for Health Information.

## Outputs of the POP Grouper

The POP Grouper was designed to develop demographic and clinical profiles, and to predict a series of health service utilization indicators based on 2 years of historical clinical and administrative data. From these 2 years of data, the POP Grouper methodology produces a person-level output file with the following information:

- Demographic profile (age, sex)
- Clinical profile
  - 226 health conditions
  - 239 health profile groups (HPGs)
  - 16 HPG categories
  - Health services accessed
  - COVID-19 flag
  - Number of chronic health conditions
  - All chronic health conditions over multiple years and the first date when a chronic health condition was identified
- Predictive indicators (for both the study period and 1 year into the future)
  - Health care cost weights
  - Number of visits to an emergency department (ED)
  - Number of visits to a primary health care physician
  - Probability of admission to long-term care (LTC) for those age 65 and older (for 1 year into the future only)
  - Probability of admission to a hospital inpatient bed for pneumonia or acute infectious/ parasitic respiratory disease (for 1 year into the future only)

The following sections provide an overview of the POP Grouper's clinical and predictive outputs.

# Clinical outputs

This section describes the POP Grouper's clinical outputs, including health conditions, HPGs, HPG categories and functional status.

## Health conditions

The foundation of the POP Grouper is the health condition classification, which consists of a set of 226 health conditions. The health condition classification uses diagnosis information from historical clinical administrative data from a person's encounters with the health system and identifies which of the 226 conditions the person has.

225 of the 226 health conditions are identified using the following sources:

- Diagnoses from the *International Statistical Classification of Diseases and Related Health Problems*:
  - Ninth Revision (ICD-9)
  - Ninth Revision, Clinical Modification (ICD-9-CM)
  - Tenth Revision (ICD-10)
  - Tenth Revision, Canada (ICD-10-CA)
  - Tenth Revision, Clinical Modification (ICD-10-CM)
- Codes from the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision* (DSM-5-TR)
- Clinical data elements from the Resident Assessment Instrument–Minimum Data Set 2.0 (RAI-MDS 2.0), interRAI Long-Term Care Facilities (interRAI LTCF), Resident Assessment Instrument–Home Care (RAI-HC), interRAI Home Care (interRAI HC) and Resident Assessment Instrument–Mental Health (RAI-MH)

1 health condition — healthy newborn — is identified by age.

For most clinical data sources, the presence of a diagnosis at a single point in time is enough information to identify a health condition in the health condition classification. However, for patient-level physician billing and primary care visit data, which is used to capture physician care, an additional step is required to assign health conditions — namely, applying tagging rules. Tagging rules are used to mitigate against false-positive disease tagging from physician billing data, which is used as a mechanism to pay physicians and not inherently as a clinical data source.

Additionally, the POP Grouper health condition classification incorporates clinical overrides, which remove redundancies that may exist on a person's clinical profile after assigning health conditions. Clinical overrides represent a transition point in the classification where the perspective shifts from looking at health conditions individually to looking at the clinical profile of the person holistically.

The determination of the 226 health conditions, the conditions' diagnosis mappings, the tagging rules and the clinical overrides are all components of the health condition classification included in the POP Grouper. [Appendix A](#) contains a list of the 226 health condition codes in the POP Grouper and their descriptions. A person can have from 1 to many health conditions based on their diagnosis.

## Health profile groups and categories

The HPG methodology leverages all of the methodology used in the assignment of health conditions and then synthesizes an individual's clinical profile down to the most complex and clinically relevant health condition present.

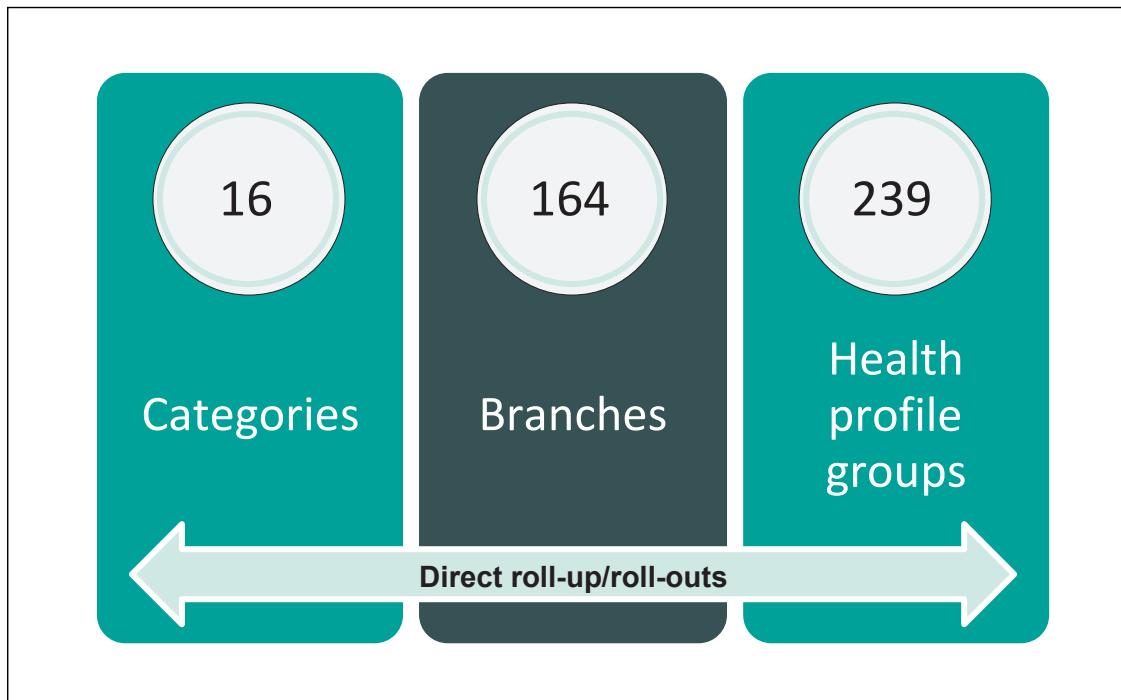
The HPG methodology consists of the following key components:

- **Branches:** The 226 health conditions are rolled up to 164 branches. Branches group health conditions that are clinically similar and that require similar resources. There is also a branch for health system users with no health conditions and a branch for non-users.
- **Ranking:** The 164 branches are ranked from the most to least clinically complex and resource intensive. For individuals with more than one health condition, this hierarchy is used to identify the highest-ranking branch; individuals are then assigned to that 1 branch. This is the branch used to form the basis of their HPG.
- **Presence of relevant comorbidities:** The majority of branches are then further segmented into 2 — those with and those without major/moderate comorbidities, resulting in a total of 239 HPGs.
- **Categories:** Each of the 164 branches is also mapped to 1 of 16 categories. The categories provide broad information about the type (e.g., acute, chronic, cancer, mental health, newborn, obstetrics, palliative) and severity (e.g., minor, moderate, major) of the HPG.



All components of the HPG classification are connected. As illustrated in the figure below, the 164 branches can be rolled up into 1 of 16 categories or further segmented into the 239 HPGs. This allows users to analyze the data at the level most meaningful to them.

**Figure** Relationship between components of the HPG classification



**Source**

Population Grouping Methodology, 2023, Canadian Institute for Health Information.

[Appendix B](#) contains a list of the 239 HPG codes in the POP Grouper and their descriptions. A person can have only 1 HPG that represents the most complex and clinically relevant health condition present.

[Appendix C](#) contains a list of the 16 HPG category codes in the POP Grouper and their descriptions.

## Health pandemic flag

In light of the pandemic that began in 2020, a COVID-19 flag has been added to the output of the POP Grouper to help identify persons treated for COVID-19. Each person in the population will be assigned a value using this health pandemic flag to differentiate among

- Diagnosis not present;
- Confirmed virus;
- Suspected virus; or
- Treated for COVID-19 with confirmed or suspected virus (assigned when there is no clear indication to further differentiate between confirmed and suspected cases).

## Longitudinal chronic health conditions

Version 1.4 of the methodology includes a longitudinal output file that identifies chronic health conditions before applying the clinical override on an individual's clinical profile. Conditions are identified over multiple years, including an index date (i.e., the first date when the condition was identified) and the count of total chronic health conditions. In total, 82 health conditions are classified as chronic.

## Predictive outputs

### Data years

The POP Grouper divides data years into 2 time periods — concurrent and prospective.

- The concurrent period refers to the interval of time for which historical clinical data is compiled to build clinical profiles. The methodology uses a 2-year concurrent period. Predictive indicators for the concurrent period are also provided by the methodology.
- The prospective period is the time period in the future for which health system activity and utilization are being predicted. The methodology defines the prospective period as the 1 year following the concurrent period.

## Predicted health care cost weights

CIHI's POP Grouper includes 2 cost weight indicators (i.e., a relative measure of health care costs): 1 for the 2-year reference period (concurrent period) and 1 for the future year following the reference period (prospective period). Each of these cost weights encompasses the hospital inpatient, day surgery and ED costs that are covered by hospital budgets, as well as LTC and publicly funded physician costs.

The cost weight indicator methodology and the values it assigns are based on regression models. The methodology includes 2 cost models, one based on health conditions and the other on HPG. These models use cost as the response variable. In the health condition model, the predictor variables are age, sex, the health conditions that remain assigned to the person after the clinical overrides are applied, the interaction effects for several hundred pairs of health conditions, the number of health conditions and the LTC ADL score assigned to the person. In the HPG model, the predictor variables are the HPG and the LTC ADL score assigned to the person.

Person-level cost weights are assigned to all persons who are eligible for health care in the jurisdiction as identified through the insured persons data. For cost weight assignment, the methodology splits this eligible population into 3 distinct sub-populations.

In the health condition model:

- **Non-users:** Assigned a concurrent cost weight of 0 and a prospective cost weight based on age and sex
- **Users without health conditions:** Assigned concurrent and prospective cost weights based on age and sex
- **Users with health conditions:** Assigned concurrent and prospective cost weights based on knowledge of the presence or absence of each of the 226 health conditions during the concurrent period, influential 2-way health condition interactions, number of health conditions and the LTC ADL score (whether it's high or low)

In the HPG model:

- **Non-users and users without health conditions:** Assigned cost weights based on the average cost of all individuals in each HPG in each of the concurrent and prospective periods
- **Users with health conditions:** Assigned concurrent and prospective cost weights based on knowledge of the presence of an HPG and the LTC ADL score (whether it's high or low)

An exception to the above logic applies to persons who are not eligible for health care on the last day of the concurrent period; they are assigned a prospective cost weight of 0.

## Predicted use of selected health system resources

In addition to predicting cost, CIHI's POP Grouper includes 4 predictive indicators of health system usage. Using age, sex, health conditions and interaction effects for key health conditions as predictor variables, regression models were developed to predict the following use of health care services:

- Number of visits to an ED in each of the concurrent and prospective periods;
- Number of visits to a primary health care provider in each of the concurrent and prospective periods;
- Probability of entering LTC for those age 65 and older during the prospective period; and
- Probability of entering a hospital inpatient bed for pneumonia or acute infectious/parasitic respiratory disease for those age 20 and older during the prospective period.

For both the cost weight models and the 4 additional models to predict health system utilization, the data was randomly split into 2 partitions; 1 partition consisted of 70% of the records and 1 partition consisted of the remaining 30% of the records. The 70% partition was used in the derivation of the model (estimation data set) and the 30% partition was used to evaluate the goodness of fit of the predicted number of visits (validation data set).

# Appendices

## Appendix A: 226 health conditions

Health condition code	Description
A01	Congenital malformation of the nervous system (including spina bifida)
A02	Hereditary/degenerative condition of the nervous system
A03	Muscular dystrophy/other myopathy
A04	Parkinson's disease/parkinsonism
A05	Multiple sclerosis/other demyelinating disease of the central nervous system
A06	Cerebral palsy
A07	Paralytic syndrome/spinal cord injury
A08	Disorder of the peripheral nervous system (including carpal tunnel, Bell's palsy)
A09	Epilepsy
A10	Other cerebral and spinal disease/disorder
A11	Other disease of the nervous system
A41	Stroke
A42	Cerebrovascular disorder (excluding stroke)
A43	Transient ischemic attack
A44	Intracranial injury
A45	Skull fracture
A46	Concussion
A47	Infection/inflammation of the nervous system
A48	Nerve injury
A81	Coma, unspecified
A82	Seizure
A83	Migraine/other headache
A84	Neurological, sensory, cognitive sign/symptom
B01	Cataract/lens disorder
B02	Retinopathy
B03	Strabismus
B04	Disorder of the eyelid/lacrimal system
B05	Vision impairment (including blindness)
B06	Glaucoma
B07	Other eye disease/disorder
B41	Retinal break/detachment

<b>Health condition code</b>	<b>Description</b>
<b>B42</b>	Infection/inflammation of the eye
<b>B43</b>	Injury of the eye and periocular area
<b>C01</b>	Congenital/acquired malformation of the ear/nose/throat
<b>C02</b>	Disease of the oral cavity/salivary gland/jaw
<b>C03</b>	Dental caries/gingivitis
<b>C04</b>	Chronic upper respiratory condition (including tonsillitis)
<b>C05</b>	Hearing loss (including deafness)
<b>C06</b>	Disorder of the external ear
<b>C07</b>	Other disease of the middle/inner ear/mastoid
<b>C08</b>	Meniere's disease/dizziness/vertigo
<b>C41</b>	Otitis media
<b>C42</b>	Acute ENT, upper respiratory condition (including benign neoplasm, croup)
<b>D01</b>	Pleural disease (including pleural effusion)
<b>D02</b>	Congenital disorder of the respiratory system
<b>D03</b>	Chronic obstructive pulmonary disease (COPD)
<b>D04</b>	Pulmonary hypertension
<b>D05</b>	Other chronic lung disease
<b>D06</b>	Asthma
<b>D41</b>	Respiratory failure
<b>D42</b>	Pneumonia
<b>D43</b>	Acute infectious/parasitic respiratory disease (excluding pneumonia)
<b>D44</b>	Acute and other respiratory disease/disorder
<b>D81</b>	Sign/symptom of the respiratory system
<b>E01</b>	Heart failure
<b>E02</b>	Malformation of the cardiovascular system
<b>E03</b>	Cardiac valve disease
<b>E04</b>	Coronary artery disease
<b>E05</b>	Arrhythmia
<b>E06</b>	Other heart disease
<b>E07</b>	Peripheral venous disease/phlebitis/thrombophlebitis/deep vein thrombosis (DVT)
<b>E08</b>	Uncomplicated varicose veins
<b>E09</b>	Other vascular system disease
<b>E10</b>	Hypertension
<b>E11</b>	Aortic aneurysm
<b>E12</b>	Peripheral artery disease
<b>E41</b>	Acute myocardial infarction/shock/arrest

Health condition code	Description
E43	Unstable angina
E82	Sign/symptom of the cardiovascular system
F01	Congenital malformation of the digestive/hepatobiliary system
F02	Gastroesophageal reflux disease
F03	Other disease of the esophagus
F04	Gastritis/duodenitis
F05	Hernia
F06	Inflammatory bowel disease (including Crohn's, ulcerative colitis)
F07	Vascular disorder of the intestine (including ischemic bowel)
F08	Diverticulitis
F09	Hemorrhoids
F10	Benign neoplasm/polyp in colon, rectum, anus
F11	Other rectal/anal disorder
F12	Other disease/disorder of the digestive system
F41	Acute gastrointestinal infection
F42	Unspecified gastrointestinal hemorrhage
F43	Gastrointestinal obstruction
F44	Peptic ulcer
F45	Peritoneal disease (including peritonitis)
F46	Disease of the appendix
F81	Sign/symptom, digestive/hepatobiliary system
F82	Abdominal pain
G01	Cirrhosis
G02	Chronic liver disease (including hepatitis)
G03	Pancreatic disease
G04	Acute liver disease/other hepatic disorder
G05	Disease of the gallbladder/biliary tract
H01	Rheumatoid/other inflammatory arthropathy (excluding gout)
H02	Osteoarthritis
H03	Crystal arthropathy (including gout)
H04	Osteoporosis
H05	Other bone disease
H06	Vertebral/disc/other disease of the back
H07	Systemic connective tissue disorder (including lupus, scleroderma)
H08	Musculoskeletal malformation (excluding spine)
H09	Myositis and soft tissue disorder (including muscle inflammation)

<b>Health condition code</b>	<b>Description</b>
H10	Other musculoskeletal/connective tissue condition
H41	Traumatic amputation of the arm/hand/leg/foot
H42	Fracture/dislocation of the vertebrae/pelvis
H43	Fracture of the femur
H44	Other fracture/dislocation
H45	Benign/unspecified musculoskeletal neoplasm
H46	Joint/tendon disorder and injury (including pain/sprain/strain)
H47	Musculoskeletal infection
H81	Neuromuscular sign/symptom
H82	Back pain
I01	Autoimmune skin disorder
I02	Papulosquamous disorder/psoriasis
I03	Eczema/dermatitis/hives
I04	Acne/rosacea
I05	Skin ulcer (including decubitus)
I06	Benign skin neoplasm
I07	Benign disorder of the breast
I08	Disease of the hair/nail/sweat glands
I09	Other condition of the skin/subcutaneous tissue
I41	Serious burn/frostbite
I42	Skin infection (including cellulitis)
I43	Superficial skin injury/contusion/non-serious burn
I81	Sign/symptom, skin
J01	Cystic fibrosis
J02	Diabetes mellitus
J03	Goitre
J04	Hyperthyroidism
J05	Hypothyroidism
J06	Adrenal disorder
J07	Other disease of the endocrine system
J08	Malnutrition/vitamin deficiency
J09	Hypercholesterolemia/other dyslipidemia
J10	Obesity
J11	Disorder of the electrolyte acid base balance
J12	Hypoglycemia
J13	Other disorder of metabolism



<b>Health condition code</b>	<b>Description</b>
<b>K01</b>	Chronic kidney disease/failure
<b>K02</b>	Benign/unspecified urinary neoplasm
<b>K03</b>	Other disease/disorder of the bladder/urethra
<b>K04</b>	Other disease of the urinary system
<b>K05</b>	Prostate disorder
<b>K06</b>	Other disease of the male reproductive system
<b>K07</b>	Urinary incontinence (stress)
<b>K41</b>	Acute/other kidney disease/failure
<b>K42</b>	Urinary tract infection (UTI)/cystitis
<b>K43</b>	Urinary obstruction/retention
<b>K81</b>	Sign/symptom of the urinary system
<b>L01</b>	Female infertility
<b>L02</b>	Menstruation disorder (including menopause)
<b>L03</b>	Congenital/other female reproductive condition
<b>L04</b>	Endometriosis/pelvic inflammatory disease
<b>L05</b>	Other uterine/fallopian/ovarian condition (including prolapse, fistula)
<b>M41</b>	Antepartum condition
<b>M42</b>	Unsuccessful/ectopic pregnancy
<b>M43</b>	Completed pregnancy
<b>N41</b>	Extremely low birth weight or immaturity
<b>N42</b>	Serious perinatal condition
<b>N43</b>	Complicated neonatal condition
<b>N44</b>	Healthy newborn
<b>O01</b>	Disease of the white blood cells (including neutropenia)
<b>O02</b>	Anemia disorder (excluding nutritional)
<b>O03</b>	Coagulation/hemorrhagic disorder
<b>O04</b>	Spleen disorder
<b>O05</b>	Lymphatic system disorder (excluding spleen)
<b>O06</b>	Disorder of the immune mechanism
<b>O07</b>	Other disease of the blood/blood-forming organs
<b>P01</b>	Human immunodeficiency virus (HIV) infection
<b>P02</b>	Tuberculosis disease
<b>P03</b>	Sexually transmitted infection (excluding HIV)
<b>P41</b>	Sepsis
<b>P42</b>	Influenza
<b>P43</b>	Other viral infection

<b>Health condition code</b>	<b>Description</b>
<b>P44</b>	Other bacterial infection
<b>P45</b>	Other/unspecified infection
<b>Q01</b>	Dementia (including Alzheimer's disease)
<b>Q02</b>	Delusional disorder (including schizophrenia)
<b>Q03</b>	Mental disorder resulting from brain injury or other illness
<b>Q04</b>	Depression
<b>Q05</b>	Bipolar/manic mood disorder
<b>Q06</b>	Personality disorder
<b>Q07</b>	Drug/alcohol dependence
<b>Q08</b>	Eating disorder
<b>Q09</b>	Intellectual disorder/delay
<b>Q10</b>	Developmental disorder (including autism spectrum)
<b>Q11</b>	Neurotic/anxiety/obsessive compulsive disorder
<b>Q12</b>	Adjustment reaction/stress
<b>Q13</b>	Emotional and behavioural disorder with onset generally in childhood
<b>Q14</b>	Other/unspecified mental disorder/condition
<b>Q81</b>	Delirium
<b>Q82</b>	Mental health sign/symptom
<b>R01A</b>	Brain cancer
<b>R02C</b>	Oral/ear/nose/throat cancer
<b>R03D</b>	Lung cancer
<b>R04F</b>	Colorectal cancer
<b>R05F</b>	Other digestive/hepatobiliary cancer
<b>R06H</b>	Musculoskeletal cancer
<b>R07K</b>	Renal cancer
<b>R08I</b>	Breast cancer
<b>R09I</b>	Skin cancer
<b>R10J</b>	Thyroid cancer
<b>R11K</b>	Prostate cancer
<b>R12K</b>	Bladder cancer
<b>R13L</b>	Ovarian cancer
<b>R14L</b>	Uterine cancer
<b>R15L</b>	Cervical cancer
<b>R16O</b>	Leukemia/lymphoma
<b>R17</b>	Other/unspecified primary cancer
<b>R18</b>	Metastatic cancer

Health condition code	Description
S01	Palliative state
S02	Chromosomal/other/unspecified congenital syndrome/disorder
S03	Transplant recipient
S04	Presence of ostomy
S41	Transplant complication
S42	Orthopedic complication
S43	Ostomy complication
S44	Poisoning/adverse effects
S45	Other trauma/injury (not elsewhere classified)
S46	Other complication of medical or surgical care
S47	Shock
S48	Open wound
S49	Internal trauma
S50	Reaction to transfusion/medication/anesthesia
S81	General sign/symptom (not elsewhere classified)

## Appendix B: 239 health profile groups

HPG code	Description
A001C	Paralytic syndrome with condition other than stroke without significant comorbidities
A002C	Paralytic syndrome with condition other than stroke with significant comorbidities
A003C	Paralytic syndrome with stroke
A004C	Congenital malformation of the nervous system (including spina bifida) without significant comorbidities
A005C	Congenital malformation of the nervous system (including spina bifida) with significant comorbidities
A006A	Stroke without paralytic syndrome without significant comorbidities
A007A	Stroke without paralytic syndrome with significant comorbidities
A008A	Other cerebral and spinal disorder (including benign neoplasms) without significant comorbidities
A009A	Other cerebral and spinal disorder (including benign neoplasms) with significant comorbidities
A010C	Parkinson's disease/parkinsonism without significant comorbidities
A011C	Parkinson's disease/parkinsonism with significant comorbidities
A012C	Cerebral palsy without significant comorbidities
A013C	Cerebral palsy with significant comorbidities
A014C	Major chronic nervous system condition without significant comorbidities
A015C	Major chronic nervous system condition with significant comorbidities
A030A	Cerebrovascular disorder (excluding stroke) without significant comorbidities
A031A	Cerebrovascular disorder (excluding stroke) with significant comorbidities
A032A	Seizure
A033A	Disorder of the peripheral nervous system (including carpal tunnel, Bell's palsy) without significant comorbidities
A034A	Disorder of the peripheral nervous system (including carpal tunnel, Bell's palsy) with significant comorbidities
A035C	Epilepsy without significant comorbidities
A036C	Epilepsy with significant comorbidities
A037C	Multiple sclerosis/other demyelinating disease of the central nervous system without significant comorbidities
A038C	Multiple sclerosis/other demyelinating disease of the central nervous system with significant comorbidities
A039A	Transient ischemic attack
A050A	Neurological, sensory, cognitive sign/symptom (including insomnia)
A051A	Migraine/other headache
B030C	Retinopathy without significant comorbidities
B031C	Retinopathy with significant comorbidities
B032C	Cataract/lens disorder
B050A	Retinal break/detachment
B051C	Other eye disease/disorder

HPG code	Description
B052C	Chronic vision impairment
B053A	Minor acute eye (including conjunctivitis)
C054A	Disease of the oral cavity/salivary gland/jaw
C055A	Chronic upper respiratory condition (including tonsillitis)
C056A	Disorder of the external ear
C057A	Otitis media
C058A	Acute ENT, upper respiratory condition (including colds, croup)
D001A	Respiratory failure with heart failure
D002A	Respiratory failure without heart failure
D003C	Pulmonary hypertension
D004A	Pneumonia with COPD without significant comorbidities
D005A	Pneumonia with COPD with significant comorbidities
D030C	COPD without pneumonia without significant comorbidities
D031C	COPD without pneumonia with significant comorbidities
D050A	Pneumonia without COPD
D051C	Asthma
D052A	Minor acute respiratory condition (including cough, bronchitis)
E001C	Acute myocardial infarction with heart failure without significant comorbidities
E002C	Acute myocardial infarction with heart failure with significant comorbidities
E003C	Heart failure with coronary artery disease (CAD)/arrhythmia without significant comorbidities
E004C	Heart failure with coronary artery disease (CAD)/arrhythmia with significant comorbidities
E005A	Acute myocardial infarction (AMI) without heart failure without significant comorbidities
E006A	Acute myocardial infarction (AMI) without heart failure with significant comorbidities
E007C	Heart failure without acute myocardial infarction (AMI), respiratory failure or coronary artery disease (CAD) without significant comorbidities
E008C	Heart failure without acute myocardial infarction (AMI), respiratory failure or coronary artery disease (CAD) with significant comorbidities
E009C	Cardiac valve disease without significant comorbidities
E010C	Cardiac valve disease with significant comorbidities
E011A	Unstable angina without significant comorbidities
E012A	Unstable angina with significant comorbidities
E013C	Peripheral vascular disease (PVD)/other chronic vascular diagnosis (without diabetes mellitus/hypoglycemia) without significant comorbidities
E014C	Peripheral vascular disease (PVD)/other chronic vascular diagnosis (without diabetes mellitus/hypoglycemia) with significant comorbidities
E030C	Coronary artery disease (CAD)/arrhythmia without heart failure without significant comorbidities
E031C	Coronary artery disease (CAD)/arrhythmia without heart failure with significant comorbidities
E050C	Hypertension
E051A	Sign/symptom, cardiovascular system (including chest pain, palpitations)

HPG code	Description
F001A	Major acute gastrointestinal (GI)/peritonitis without significant comorbidities
F002A	Major acute gastrointestinal (GI)/peritonitis with significant comorbidities
F030A	Unspecified gastrointestinal hemorrhage without significant comorbidities
F031A	Unspecified gastrointestinal hemorrhage with significant comorbidities
F032A	Disease of the appendix without significant comorbidities
F033A	Disease of the appendix with significant comorbidities
F034C	Inflammatory bowel disease (including Crohn's, ulcerative colitis) without significant comorbidities
F035C	Inflammatory bowel disease (including Crohn's, ulcerative colitis) with significant comorbidities
F036A	Peptic ulcer without significant comorbidities
F037A	Peptic ulcer with significant comorbidities
F050A	Hernia
F051A	Gastroesophageal reflux disease
F052A	Other disease/disorder of the digestive system
F053C	Other disease of the esophagus (including esophagitis)
F054C	Diverticulitis
F055A	Benign neoplasm and other rectal/anal disorder
F056A	Minor gastrointestinal (GI) acute condition (including GI symptom, ill-defined infection)
F057C	Gastritis/duodenitis
G001C	Pancreatic disease without significant comorbidities
G002C	Pancreatic disease with significant comorbidities
G003C	Cirrhosis without significant comorbidities
G004C	Cirrhosis with significant comorbidities
G030A	Disease of the gallbladder/biliary tract without significant comorbidities
G031A	Disease of the gallbladder/biliary tract with significant comorbidities
G032C	Chronic liver disease (including hepatitis)
H001A	Musculoskeletal infection without significant comorbidities
H002A	Musculoskeletal infection with significant comorbidities
H003A	Major acute musculoskeletal (including fracture of the femur/spine, limb amputation) without significant comorbidities
H004A	Major acute musculoskeletal (including fracture of the femur/spine, limb amputation) with significant comorbidities
H030C	Rheumatoid/osteoarthritis and other inflammatory arthropathy (excluding gout) without significant comorbidities
H031C	Rheumatoid/osteoarthritis and other inflammatory arthropathy (excluding gout) with significant comorbidities
H032C	Osteoporosis without significant comorbidities
H033C	Osteoporosis with significant comorbidities
H034C	Systemic connective tissue disorder (including lupus, scleroderma) without significant comorbidities
H035C	Systemic connective tissue disorder (including lupus, scleroderma) with significant comorbidities

<b>HPG code</b>	<b>Description</b>
<b>H050A</b>	Other bone disease
<b>H051C</b>	Musculoskeletal malformation (excluding spine)
<b>H052C</b>	Vertebral/disc and other disease of the back
<b>H053A</b>	Other fracture/dislocation
<b>H054A</b>	Back pain
<b>H055A</b>	Crystal arthropathy (including gout)
<b>H056A</b>	Myositis and soft tissue disorder (including muscle inflammation)
<b>H057A</b>	Joint/tendon disorder and injury (including pain/sprain, strain)
<b>H058A</b>	Neuromuscular sign/symptom
<b>I001C</b>	Skin ulcer (including decubitus) without significant comorbidities
<b>I002C</b>	Skin ulcer (including decubitus) with significant comorbidities
<b>I050A</b>	Minor acute skin (including dermatitis, cellulitis)
<b>J001C</b>	Cystic fibrosis
<b>J002C</b>	Diabetes/hypoglycemia with peripheral vascular disease (PVD)/other chronic vascular diagnosis without significant comorbidities
<b>J003C</b>	Diabetes/hypoglycemia with peripheral vascular disease (PVD)/other chronic vascular diagnosis with significant comorbidities
<b>J004C</b>	Diabetes/hypoglycemia with chronic kidney disease/failure without significant comorbidities
<b>J005C</b>	Diabetes/hypoglycemia with chronic kidney disease/failure with significant comorbidities
<b>J030A</b>	Adrenal/electrolyte/metabolism disorder without significant comorbidities
<b>J031A</b>	Adrenal/electrolyte/metabolism disorder with significant comorbidities
<b>J032A</b>	Diabetes/hypoglycemia without chronic kidney disease/peripheral vascular disease (PVD)/chronic vascular diagnosis without significant comorbidities
<b>J033A</b>	Diabetes/hypoglycemia without chronic kidney disease/peripheral vascular disease (PVD)/chronic vascular diagnosis with significant comorbidities
<b>J050C</b>	Other disease of the endocrine system
<b>J051C</b>	Other disorder of metabolism
<b>J052C</b>	Malnutrition/vitamin deficiency
<b>J053C</b>	Hypothyroidism
<b>J054C</b>	Obesity
<b>J055C</b>	Hypercholesterolemia/other dyslipidemia
<b>K001C</b>	Chronic kidney disease/failure (without diabetes mellitus/hypoglycemia) without significant comorbidities
<b>K002C</b>	Chronic kidney disease/failure (without diabetes mellitus/hypoglycemia) with significant comorbidities
<b>K030C</b>	Urinary incontinence (stress) without significant comorbidities
<b>K031C</b>	Urinary incontinence (stress) with significant comorbidities
<b>K032A</b>	Acute/other kidney disease/failure without significant comorbidities
<b>K033A</b>	Acute/other kidney disease/failure with significant comorbidities
<b>K050C</b>	Prostate disorder

<b>HPG code</b>	<b>Description</b>
<b>K051A</b>	Minor acute urinary condition (including urinary tract infection, cystitis)
<b>K052C</b>	Other disease of the male reproductive system
<b>K053C</b>	Other disease/disorder of the bladder/urethra
<b>L030C</b>	Endometriosis/pelvic inflammatory disease without significant comorbidities
<b>L031C</b>	Endometriosis/pelvic inflammatory disease with significant comorbidities
<b>L032C</b>	Female infertility without significant comorbidities
<b>L033C</b>	Female infertility with significant comorbidities
<b>L034C</b>	Other uterine/fallopian/ovarian condition (including prolapse, fistula)
<b>L050C</b>	Menstruation disorder (including menopause)
<b>L051A</b>	Congenital/other female reproductive condition
<b>M030</b>	Obstetrics without significant comorbidities
<b>M031</b>	Obstetrics with significant comorbidities
<b>M050A</b>	Unsuccessful/ectopic pregnancy
<b>N001</b>	Extremely low birth weight or immaturity without significant comorbidities
<b>N002</b>	Extremely low birth weight or immaturity with significant comorbidities
<b>N003</b>	Serious perinatal condition without significant comorbidities
<b>N004</b>	Serious perinatal condition with significant comorbidities
<b>N005</b>	Newborn/neonate with other complicating diagnosis
<b>N070</b>	Healthy newborn
<b>O001A</b>	Disease of the white blood cells (including neutropenia) without significant comorbidities
<b>O002A</b>	Disease of the white blood cells (including neutropenia) with significant comorbidities
<b>O030C</b>	Major chronic blood disorder (including coagulation disorders, anemia) without significant comorbidities
<b>O031C</b>	Major chronic blood disorder (including coagulation disorders, anemia) with significant comorbidities
<b>O050C</b>	Other disease of blood/blood-forming organs
<b>O051A</b>	Lymphatic system disorder (excluding spleen)
<b>P001A</b>	Sepsis without significant comorbidities
<b>P002A</b>	Sepsis with significant comorbidities
<b>P030C</b>	Human immunodeficiency virus (HIV) infection without significant comorbidities
<b>P031C</b>	Human immunodeficiency virus (HIV) infection with significant comorbidities
<b>P050A</b>	Other bacterial infection
<b>P051A</b>	Influenza
<b>P052A</b>	Sexually transmitted infection (excluding HIV)
<b>P053A</b>	Other/unspecified infection
<b>P054</b>	Other viral infection
<b>Q001</b>	Mental disorder resulting from brain injury or other illness without significant comorbidities
<b>Q002</b>	Mental disorder resulting from brain injury or other illness with significant comorbidities
<b>Q003A</b>	Delirium



HPG code	Description
Q004	Eating disorder without significant comorbidities
Q005	Eating disorder with significant comorbidities
Q006	Dementia (including Alzheimer's disease) without significant comorbidities
Q007	Dementia (including Alzheimer's disease) with significant comorbidities
Q008	Delusional disorder (including schizophrenia) without significant comorbidities
Q009	Delusional disorder (including schizophrenia) with significant comorbidities
Q010	Other major mental health disorder (including bipolar) without significant comorbidities
Q011	Other major mental health disorder (including bipolar) with significant comorbidities
Q070	Personality disorder without significant comorbidities
Q071	Personality disorder with significant comorbidities
Q072	Drug/alcohol dependence without significant comorbidities
Q073	Drug/alcohol dependence with significant comorbidities
Q074	Depression
Q075	Developmental disorder (including autism spectrum)
Q076	Neurotic/anxiety/obsessive compulsive disorder
Q077	Behavioural and emotional childhood/adolescent disorder
Q078	Other mental health disorder/condition (including adjustment reaction)
Q079	Mental health sign/symptom
R001	Metastatic cancer without significant comorbidities
R002	Metastatic cancer with significant comorbidities
R003	Brain cancer without significant comorbidities
R004	Brain cancer with significant comorbidities
R005	Other digestive/hepatobiliary cancer without significant comorbidities
R006	Other digestive/hepatobiliary cancer with significant comorbidities
R007	Lung cancer without significant comorbidities
R008	Lung cancer with significant comorbidities
R009	Leukemia/lymphoma without significant comorbidities
R010	Leukemia/lymphoma with significant comorbidities
R011	Ovarian cancer
R012	Bladder cancer without significant comorbidities
R013	Bladder cancer with significant comorbidities
R014	Musculoskeletal cancer without significant comorbidities
R015	Musculoskeletal cancer with significant comorbidities
R016	Renal cancer without significant comorbidities
R017	Renal cancer with significant comorbidities
R018	Colorectal cancer without significant comorbidities
R019	Colorectal cancer with significant comorbidities
R020	Uterine cancer

<b>HPG code</b>	<b>Description</b>
<b>R021</b>	Oral/ear/nose/throat cancer without significant comorbidities
<b>R022</b>	Oral/ear/nose/throat cancer with significant comorbidities
<b>R070</b>	Breast cancer without significant comorbidities
<b>R071</b>	Breast cancer with significant comorbidities
<b>R072</b>	Prostate cancer without significant comorbidities
<b>R073</b>	Prostate cancer with significant comorbidities
<b>R074</b>	Skin/cervical/thyroid/other unspecified cancer
<b>S001</b>	Palliative state (acute)
<b>S002A</b>	Transplant complication
<b>S003A</b>	Ostomy complication
<b>S004C</b>	Presence of ostomy
<b>S005C</b>	Transplant recipient without significant comorbidities
<b>S006C</b>	Transplant recipient with significant comorbidities
<b>S030C</b>	Chromosomal/other/unspecified congenital syndrome/disorder without significant comorbidities
<b>S031C</b>	Chromosomal/other/unspecified congenital syndrome/disorder with significant comorbidities
<b>S050A</b>	Other complication of medical or surgical care
<b>S051A</b>	Reaction to transfusion/medication/anesthesia
<b>S052A</b>	Drug/alcohol poisoning (not elsewhere classified)
<b>S053A</b>	Other trauma/injury (not elsewhere classified)
<b>S054A</b>	Open wound
<b>X001A</b>	Other major acute condition (including shock, coma) without significant comorbidities
<b>X002A</b>	Other major acute condition (including shock, coma) with significant comorbidities
<b>X003C</b>	Other major chronic condition (including congenital anomaly heart) without significant comorbidities
<b>X004C</b>	Other major chronic condition (including congenital anomaly heart) with significant comorbidities
<b>X030C</b>	Other moderate chronic condition
<b>X050A</b>	Other minor acute condition (including general symptoms)
<b>Z000</b>	Users without health conditions
<b>Z098</b>	Non-users

## Appendix C: 16 health profile group categories

HPG category code	Description
01	Palliative
02	Major Acute
03	Major Chronic
04	Major Newborn
05	Major Mental Health
06	Major Cancer
07	Moderate Acute
08	Moderate Chronic
09	Other Cancer
10	Other Mental Health
11	Obstetrics
12	Minor Acute
13	Minor Chronic
14	Healthy Newborn
15	Health System User With No Health Conditions
16	Health System Non-User



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