ICD-11:
New features, tooling environment, APIs, testing & implementation arrangements and linkages with SNOMED CT

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Why ICD-11?

ICD-11

International Classification of Diseases for Mortality and Morbidity Statistics

Eleventh Revision

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- **Up-to-date scientific knowledge – statistical continuity**

- **Serving multiple use case** (mortality & morbidity statistics, health care cost, primary care, quality and safety, progress towards SDGs, clinical documentation, research)

- **Improve usability**
  More clinical detail – code combinations
  Easy access & less expensive training

- Improved **index**

- Improved incorporation in **electronic environments** – not just a print product

- **Linkages** to other relevant classifications/ terminologies (ICD-O, ICPC, ICECI, ICF, SNOMED-CT, ATC, eML etc.)

- Improve **comparability of translations**

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Problems of ICD-10 – examples
Solved in ICD-11

- Antimicrobial resistance - essentially **missing in ICD-10**

- HIV subdivisions - **outdated** detail **in ICD-10**

- Skin cancer - melanoma types missing – basalioma **missing in ICD-10**

- Valve diseases - **outdated** structure, need by valve, less rheumatic

- Chapters 1-18 versus Chapter 19 - **clarify** when use 19 and when not for postprocedural

- **Regrouping** necessary - Allergies and autoimmune diseases

- External causes - **Loosing detail** in non-accidents; traffic accidents

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ICD-11 Chapters

01 – Infectious diseases

02 – Neoplasms

03 – Diseases of the blood or blood-forming organs

04 – Disorders of the immune system

05 – Endocrine, nutritional and metabolic diseases

06 – Mental, behavioural or neurodevelopmental disorders

07 – Sleep-wake disorders

08 – Diseases of the nervous system

09 – Diseases of the visual system

10 – Diseases of the ear or mastoid process

11 – Diseases of the circulatory system

12 – Diseases of the respiratory system

13 – Diseases of the digestive system

14 – Diseases of the skin

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ICD-11 Chapters Cont.

15 – Diseases of the musculoskeletal system or connective tissue

16 – Diseases of the genitourinary system

17 – Conditions related to sexual health

18 – Pregnancy, childbirth or the puerperium

19 – Certain conditions originating in the perinatal period

20 – Developmental anomalies

21 – Symptoms, signs or clinical findings, not elsewhere classified

22 – Injury, poisoning or certain other consequences of external causes

23 – External causes of morbidity or mortality

24 – Factors influencing health status or contact with health services

25 – Codes for special purposes

26 – Traditional medicine conditions – Module 1

V – Supplementary section for functioning - CF derived linked with WHODAS 2, MDS.

X – Extension Codes

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ICD-11 Classification System for coding Quality & Safety Events

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- Diagnostic categories

- Now module 1: Traditional medicine from ancient China now commonly used in China, Japan, Korea and elsewhere around the world

- Other modules can be added

- The Chapter is a mirror of clinical practice and reality. The TM Chapter categories were derived from:
  - **National Clinical Modifications of ICD** (i.e. Korean ICD version, KCD-7 Disease Codes of Korean Medicine);
  - **National TM Classifications** (e.g. Chinese TCM classification GB 95/97, Japanese Kampo Medicine Code Set);
  - **Regional Terminologies** (i.e. WHO International Standard Terminologies on Traditional Medicine in the Western Pacific Region);
  - The Chapter also represents the **most common diagnoses** used by TM practitioners in other Regions (e.g. Europe and US.

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ICD-11 Supplementary section for functioning

- Facilitate **generic functioning assessment**

- The entities are **linked with** the WHO Disability Assessment Schedule 2.0 (**WHO DAS 2.0**) and WHO Model Disability Survey (**MDS**). This will allow to compute general and domain specific summary scores.

- The list will includes **47 entities** is focusing on ICF functioning domains which have high explanatory power (ICF Annex 9). The list could be considered a linearization of ICF. These would be optional codes to be used via post-coordination

- **supplementary functioning codes**

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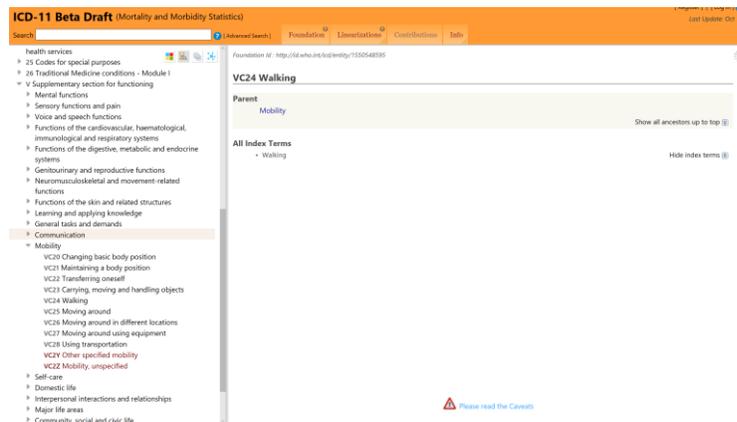
The problem of exploding cycling codes in ICD-10

- The history of cycling codes
  - **1972** ICD-9: **8 codes**
  - **1999** ICD-10: **587 codes**

- Example of a confounded code
  - V12.24 Pedal cyclist injured in collision with two- or three-wheeled motor vehicle, unspecified pedal cyclist, non-traffic accident, while resting, sleeping, eating or engaging in other vital activities

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Defusing the exploding bicycle:
500 codes in pieces

- **10 things to hit…**
  - Pedestrian / cycle / motorbike / car / HGV / train / unpowered vehicle / a tree / other

- **5 roles for the injured…**
  - Driving / passenger / cyclist / getting in / other

- **5 activities when injured…**
  - resting / at work / sporting / at leisure / other

- **2 contexts…**
  - In traffic / not in traffic

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ICD-11 Extension codes

Type 1

- Severity

- Temporality (course of the condition)

- Temporality (Time in life)

- Aetiology

- Anatomic detail Topology Anatomic location

- Histopathology

- Biological Indicators

- Consciousness

- External Causes detail

- Injury Specific detail

- Substances

Type 2

- Main Condition
  - Reason for encounter
  - Reason for admission
  - Main Resource Condition

- Present on Admission
  - Developed after admission
  - Uncertain timing relative to admission

- Provisional diagnosis

- Diagnosis confirmed by…
  - Lab
  - Serology
  - Histology
  - Genetics
  - Imaging –
  - Unspecified means

- Differential Diagnosis

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Differences to ICD-10- Coding scheme

- The **chapter numbering**:
  - **Arabic** numbers (not roman numerals)

- The **coding scheme for categories**:
  - Minimum 4 characters
  - 2 levels of subcategories

- **Coding scheme**
  - A letter is always in the 2nd position to differentiate from ICD-10 codes
  - No l,I (L,i); 0,O (Zero, o)

- **First character of code always relates to the chapter**. Numbers 1-9 are used for the first nine chapters and letters are used for chapters 10 to 26

- **Residual** categories use **Y for other, Z** for unspecified

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Coding combinations for more detail

- One disease => one code

    Stem codes only can be used alone

    i.e. extension codes are **never** used alone

    Fracture of humerus =
    NB52.4 Fracture of shaft of humerus

- One disease => multiple codes (cluster)

    Stem code + stem code(s)

    Mitral valve stenosis with right ventricular failure =
    BB60.Z / BC83
    (BB60.Z Mitral valve stenosis, unspecified; BC83 Right ventricular failure)

    Stem code + extension code(s)

    Fracture of right humerus shaft =
    NB52.4 & XK876572005
    (NB52.4 Fracture of shaft of humerus; XK876572005 Right)

    Stem code + stem code(s) + extension code(s)

    Comminuted fracture of right humerus shaft=
    NB52.4 & XK876572005 & XJ2006159364
    (NB52.4 Fracture of shaft of humerus, XK876572005 Right; XJ2006159364 Comminuted fracture)

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ICD-11 Content model

1. ICD Concept Title
2. Hierarchy, Type and Use
    a)Parents
    b)Type
    c)Use
3. Textual Definition(s)
    a) Description (short)
    b) Definition (long)
4. Terms
    a) Index Terms
        1. Synonyms
        2. Inclusion Terms
    b) Exclusion Terms

5. Clinical Description
    1. Body System(s)
    2. Body Part(s)*[Anatomical Site(s)]*
    3. Manifestation Properties
        1. Signs & Symptoms
        2. Findings
    4. Causal Properties
    5. Etiology Type
        1. Infection (agents)
        2. Injury (mechanisms)
    6. Risk Factors
    7. Genomic Characteristics
    8. Temporal Properties
    9. Severity Properties
    10. Functional Properties
    11. Specific Condition Properties
    12. Treatment Properties
    13. Diagnostic Criteria

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Foundation Component & Tabular Lists of ICD–11

The **Foundation Component**

- is a multidimensional **collection of all ICD entities**.

- Entities can be **diseases, disorders, injuries, external causes, signs and symptoms**. Some entities may be very broad e.g. 'injury of the arm', others are more detailed, e.g. 'laceration of the skin of the thumb.

- has the necessary **information** to use the entities to **build a tabular list** (a mono hierarchy in the style of a traditional statistical classification). E.g. includes information on where and how a certain entity is represented in a tabular list, whether it becomes a grouping, a category with a stem code, or whether it is mentioned as an inclusion term in a particular category.

The ICD-11 Tabular lists

- Tabular lists are **subsets** of the foundation component, that are:

  - **Fit for a particular purpose:** reporting mortality, morbidity, or other uses

  - In a tabular list, **entities** of the foundation **become categories** that are **Jointly Exhaustive** and **Mutually Exclusive** of each other

  - Each catergory is given **a single parent**

  - Residual categories: **Other (*.8) Unspecified (*.9)** generated for each linearization

Examples of ICD-11 Tabular lists

- ICD-11 Mortality and Morbidity Statistics (ICD-11 MMS)
- ICD-11 Primary Care
- Specialty tabulations
  - Dermatology
  - Oncology
  - Mental Health
  - Traditional Medicine
  - …
- National tabulations (CM, AM, CA, GM…)
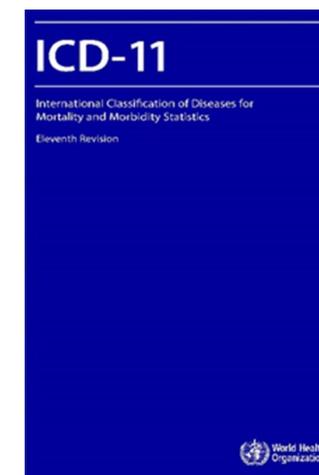
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ICD-11
Making Classification from Foundation

Foundation Component

Making Classification from Foundation

Foundation Component

ICD-11 MMS

Exclusions (or shown in grey)
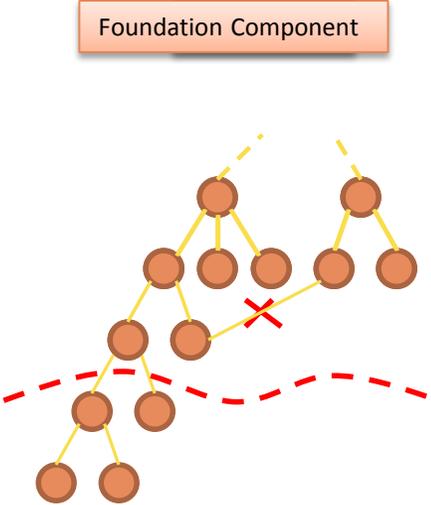
Index terms

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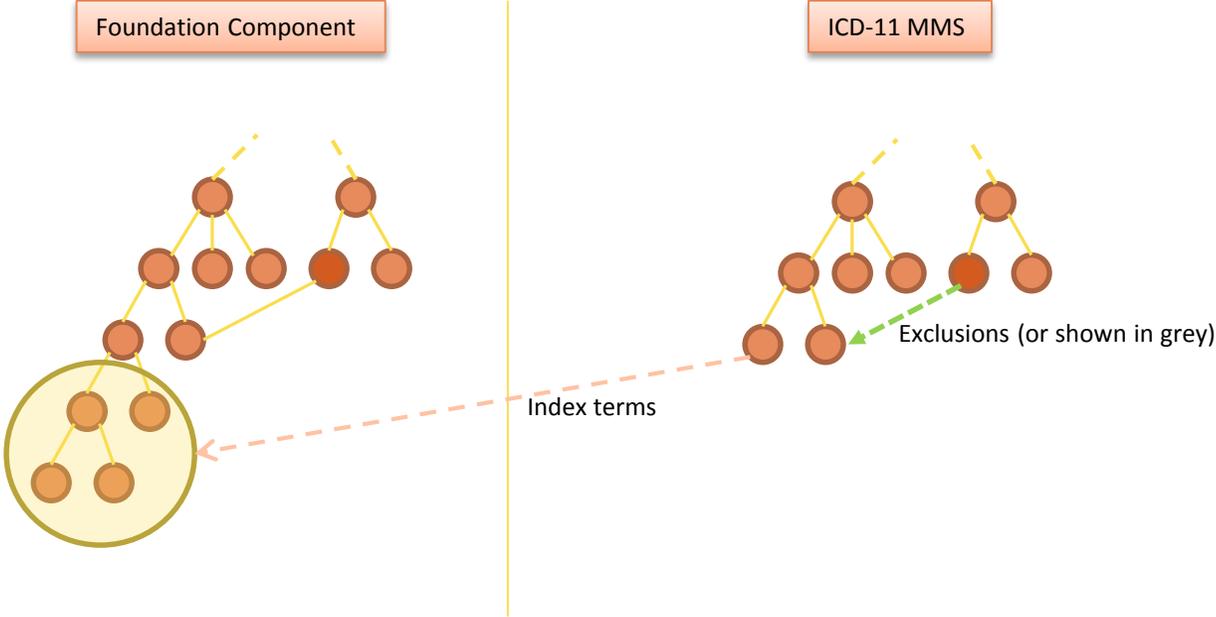
ICD-11 Index terms

- Synonyms
- Entities and Synonyms below the "shoreline" include
  - categories in the ICD-11 MMS
    - e.g. *Hutchinson-Gilford syndrome* under **LD2B Syndromes with premature ageing appearance as a major feature**
  - Residual categories
    - e.g. *Capsular age-related cataract* under **9B10.0Y Other specified age-related cataract**

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Example of a telescopic tabulations

Title	Primary Care	MMS.	Ophthalm.
Cataract	code	code	code
Age-related cataract	code	code	code
Cortical age-related cataract	other	other	code
Nuclear age-related cataract	other	other	code
Cataracta brunescens	other	other	code
Nuclear sclerosis cataract	other	other	code
Capsular and Subcapsular age-related cataract	other	other	code
Capsular age-related cataract	other	other	code
Anterior subcapsular polar age-related cataract	other	other	code
Posterior subcapsular polar age-related cataract	other	other	code
Incipient age-related cataract	other	other	code
Coronary age-related cataract	other	code	code
Punctate age-related cataract	other	code	code
Water clefts	other	other	code
Advanced or mature age-related cataract	other	other	code
Mature age-related cataract	other	code	code
Subtotal advanced or mature age-related cataract	other	other	code
Advanced or mature age-related cataract, total cataract	other	other	code
Morgagnian age-related cataract	other	other	code
Calcified age-related cataract	other	other	code
Combined forms of age-related cataract	other	other	code

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ICD-11 & SNOMED CT Harmonization

- 1200 ICD-11 concepts added in SNOMED CT from the ICD-11 Mortality and Morbidity Linearization

- Editorial feedback on ICD-11 MMS

- Mapping methodology review

- Heart diseases are found in different chapters:
  - Circulatory
  - Infectious
  - Endocrine
  - Developmental
  - ....

Entity **has a code**

grouped into a category;
has URI for recording, if desired

Shoreline

1C5C.11	http://id.who.int/icd/entity/1959883044
1C5D.13	http://id.who.int/icd/entity/685093552
1C5.1Y	http://id.who.int/icd/entity/1302232870
1C5.1Z	

http://id.who.int/icd/entity/1104303944
http://id.who.int/icd/entity/588527933
http://id.who.int/icd/entity/854762584
http://id.who.int/icd/entity/1543765035
http://id.who.int/icd/entity/682536148
http://id.who.int/icd/entity/307264938
http://id.who.int/icd/entity/961032639
http://id.who.int/icd/entity/1306878274
http://id.who.int/icd/entity/804089791
http://id.who.int/icd/entity/1040970454
http://id.who.int/icd/entity/36782335
http://id.who.int/icd/entity/1736084843
http://id.who.int/icd/entity/1530937152
http://id.who.int/icd/entity/608978790
http://id.who.int/icd/entity/1501615629

http://id.who.int/icd/entity/1935092859
http://id.who.int/icd/entity/1026551291
http://id.who.int/icd/entity/751399056
http://id.who.int/icd/entity/1563156715
http://id.who.int/icd/entity/1596449540
http://id.who.int/icd/entity/980168338
http://id.who.int/icd/entity/730510331
http://id.who.int/icd/entity/1233304838
http://id.who.int/icd/entity/1321303663
http://id.who.int/icd/entity/2003001085
http://id.who.int/icd/entity/304649065
http://id.who.int/icd/entity/63835650
http://id.who.int/icd/entity/487269828
http://id.who.int/icd/entity/1697630330
http://id.who.int/icd/entity/1938462328
http://id.who.int/icd/entity/2064398473
http://id.who.int/icd/entity/1793762788
http://id.who.int/icd/entity/262236278
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http://id.who.int/icd/entity/508032285
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http://id.who.int/icd/entity/390042715
http://id.who.int/icd/entity/419706488
http://id.who.int/icd/entity/6555116
http://id.who.int/icd/entity/1664016479
http://id.who.int/icd/entity/840525023
http://id.who.int/icd/entity/1465035083
http://id.who.int/icd/entity/1186214944
http://id.who.int/icd/entity/1998718899
http://id.who.int/icd/entity/1600014919
http://id.who.int/icd/entity/1320736556
http://id.who.int/icd/entity/965498095
http://id.who.int/icd/entity/1127435854
http://id.who.int/icd/entity/223956768
http://id.who.int/icd/entity/1132542967
http://id.who.int/icd/entity/372424530

- Mapping residual categories and entities that are below the shoreline

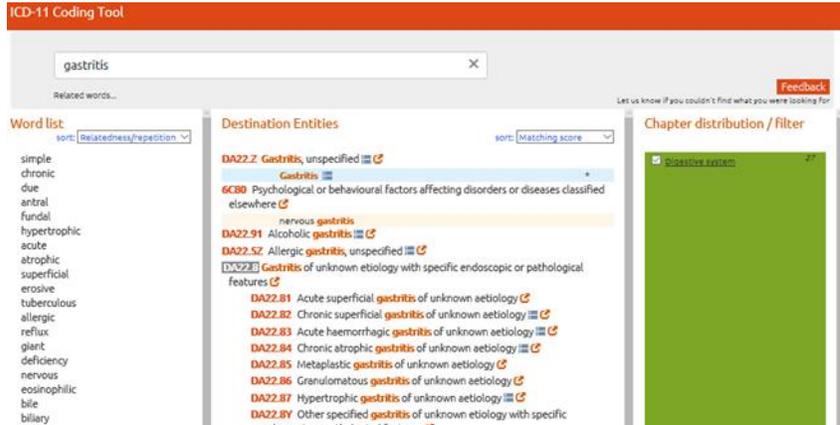# Mapping SNOMED-CT with ICD-11

- Map SNOMED CT with ICD-11 Foundation Component. This will allow for:
  - more stability
  - increased detail
  - better comparability

- All ICD-11 Foundation Component elements will be defined by "query expressions" against the Common Ontology

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ICD-11 Tools

http://apps.who.int/classifications/icd11/browse/f/en

- **Coding tool** (multilingual)
  - Index based searching of classification
  - spelling-synonyms no problem

- **ICD-11 browser** (multilingual)
  - See foundation and tabular list (linearization) – grid view - postcoordination
  - Download versions
  - 'frozen' versions
  - See differences

- **Proposal and commenting tool**
  - Make suggestions and discuss them
  - Notifications

- **Review tool**
  - Peer review categories and definition

- **Testing tool** (multilingual)
  - Coding of diagnostic terms in ICD-11 and ICD-10
  - Test classification in multiple languages.

- **Translation tool**
  - Translate in your language

- **Mapping tool**
  - See mapping at detailed level – download maps
  - Comment mapping to and from ICD-10

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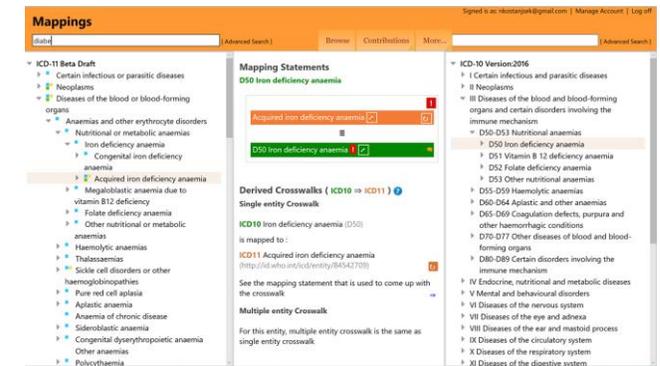
Hosting arrangements for ICD Tools

- Cloud-based
  - more reliable
  - higher performance

- New web-domains
  - URIs:
    - e.g.http://id.who.int/icd/entity/2016376826
  - URLs
    - www.icd.who.int
    - https://icdaccessmanagement.who.int
    - www.icf.who.int
    - www.ichi.who.int

User guidance for accurate coding in ICD-11
Example: searching for "breast cancer" in the ICD-11 Spanish Coding tool

The index term highlighted in blue and marked with a star is pointing to the most accurate code match

Ongoing improvement of ICD-11 Coding Tool
Example: Left Frontal Glioblastoma

Post-coordination combinations are automatically indexed for the following axes

- Laterality
- Course (acute /chronic)
- Specific anatomy (when the value set has less than 50 items)

ICD-11 – ICD-10 Mapping tool

ICD-11 Translation Platform
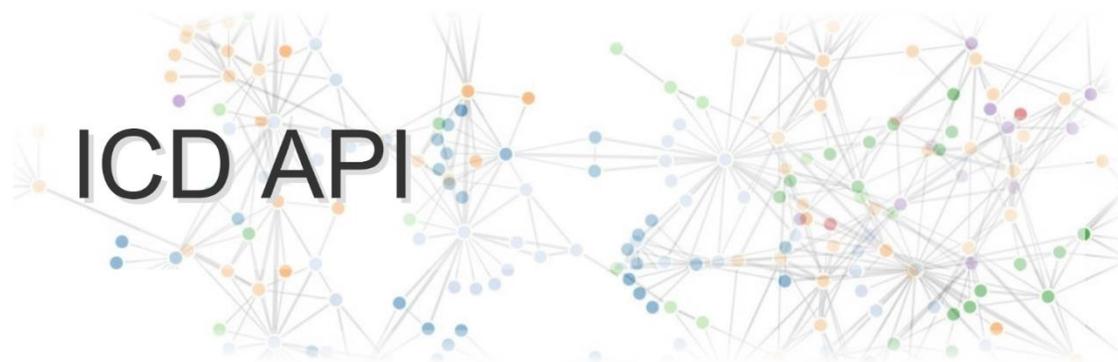## Web application for multilingual representations of ICD-11 content
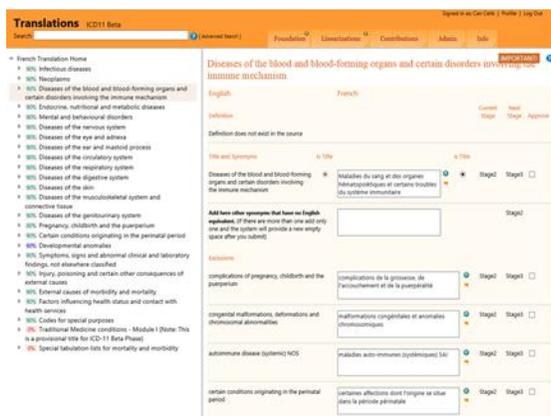
Platform features

– use of existing translations
  - through **translation memory**
  - currently ICD-10 translations in 7 languages are loaded into the memory
– flexible translation workflow
  - **multiple translator roles** and translation stages
    – 3 translator roles with different access rights
    – Higher level translators' work cannot be undone by lower level translators
– multiple translators can **work simultaneously**
– supports **commenting on the translations**
– Handles special requirements of terminology translations (does not force 1 to 1 translation).

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ICD API (Application-Programming Interface)
https://icdaccessmanagement.who.int

ICD-11 | Belgian Terminology Day | 28 March 2018

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ICD-11 Web Services

Web service

Web site

What is it?

– Web services are software components that can be accessed by other software

– They use the same architecture and protocols with the web.

– They allow software systems to access capabilities of other software

Benefits

– easier access and use of ICD with using appropriate software (simplification)

– effective response to ICD information needs from multiple stakeholders (customization)

– consistency of ICD multilingual versions in an electronic environment (automation)

– increase coverage and quality of ICD coding (implementation)

– automation of ICD updates

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Examples of ICD-11 API use
(Proof-of-concept)

- ICD-11 on the Go
  - Mobile browser with voice recognition

- ICD API playground
  - dynamic web page to query ICD-11URIs

- ICHI Browser
  - Extension codes: *Additional anatomy* and *Medicaments* directly pulled from ICD-11 MMS through API

- WHO electronic List of Essential Medicienes
  - Browsing and searching Essential Medicienes by Indication (ICD-11 category)

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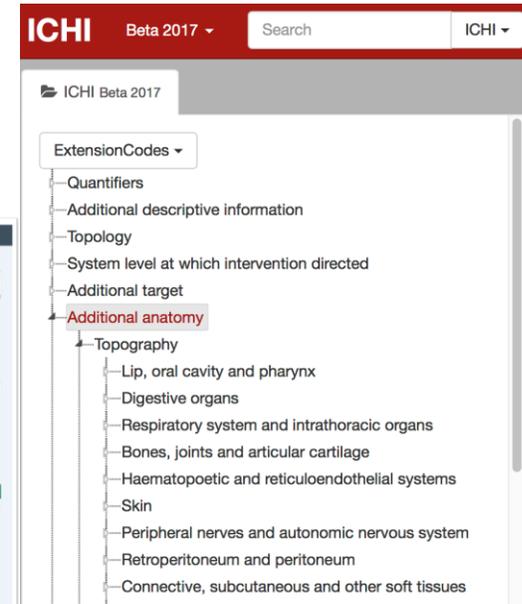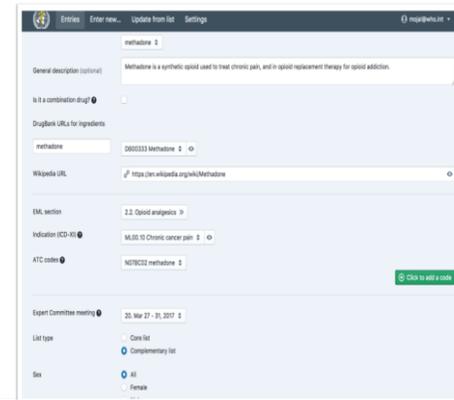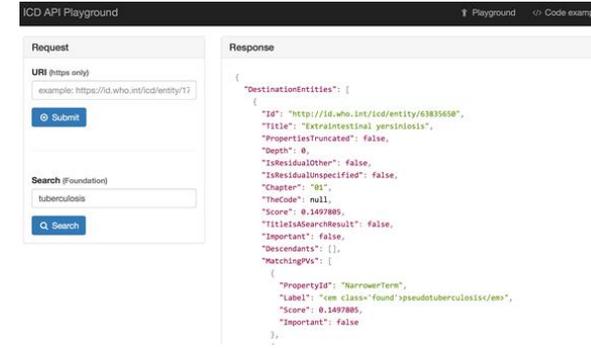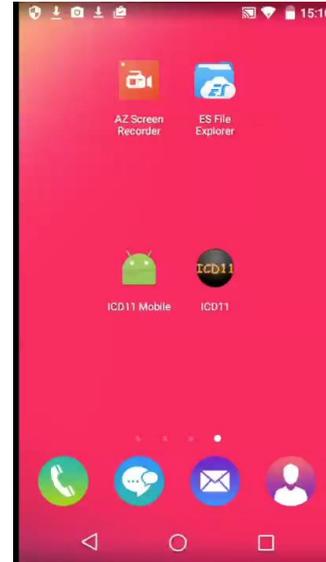
ICD-11 Field Testing components & scope

- **Generic LINE coding (morbidity)** of **298 diagnostic terms** which represent 47 of ICD-11 MMS priority areas.

- **Generic CASE coding (morbidity)** of **30 case scenarios** which had the main condition as well as other condition(s) listed.

- **Specialty specific LINE and CASE coding (morbidity)** e.g. Dermatology, Quality and Safety, Traditional Medicine, International Association for the Study of Pain, German Medical Societies etc.

- **Mortality LINE (200 CoD terms)** and **MULTIBLE CAUSE (58 Death Certificates) coding**

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Field testing with ICD

ICDfit interface for Generic LINE coding (morbidity)

- Each diagnostic term is **coded** by raters in **ICD-11 and ICD-10**.

- Following the code assignment, raters are asked to **report on**:
  - difficulties encountered
  - assess the level of coding granularity
  - problems with ambiguity

- Coding time is taken automatically

- Implementation: **28 countries, 62.873 code assignments** made by **630 raters**

Examples of Dx terms used in testing: Incarcerated ventral hernia, Perforated appendicitis, Transmural necrosis of portion of small bowel, Rheumatoid arthritis with anemia of chronic disease, Posttraumatic osteoarthritis right knee, Methicillin-Resistant Staphylococcus Aureus (MRSA) Septicemia, Severe anaphylaxis to hornet sting, Type 2 diabetes mellitus with diabetic foot, Frontotemporal dementia

March 2018

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FTC

All FTCs

FTS

All FTSs

Chapter

01 Infectious Diseases [15 entities]

Case

Sepsis due to Escherichia coli (E. coli)

Summary

raters	cases	assignments	done	waiting
542	1	548	393	155

No distances data!

ICD-11 list

#	code
358	1B40
14	KA40.4
3	1B70
2	1B48
2	1H2Z
1	1B40 Sepsis due to Escherichia coli

ICD-10 list

#	code
190	A41.5
52	A415
48	P36.4
30	A41.8
12	A418
10	A41.4

36

Example of ICD-11 coding <u>distance measure</u> for Diagnostic term: "Clostridium difficile diarrhea"

Distance	Match type	Gold standard Code in ICD-11	Actual code assignment in ICD-11 (n=286)	Actual code assignment - ICD-11 Title
0	Exact match	1A04	**1A04** (85% of coders)	**Enterocolitis due to Clostridium difficile**
1	Category match (i.e. Sibling/Residual/ Parent match)	1A04	1A0Y (3% of coders)	Other specified bacterial intestinal infections
2	Block match	1A04	1A1Y (2% of coders)	Other specified bacterial foodborne intoxications
3	Section match	1A04	1A6Y (0.7% of coders)	Other specified protozoal intestinal infections
4	Chapter match	1A04	--	--
5	Different Chapter	1A04	MF21 (2% of coders)	Diarrhoea

Distance between actual & gold standard code assignment
(Distance calculator for ICD coding)

ICD-11 and ICD-10 distance

Legend: ICD-11, ICD-10

distance 0	distance 1	distance 2	distance 3	distance 4	distance 5	n.d.
Exact match	Category match	Block match	Section match	Chapter match	Diff. Chapter	

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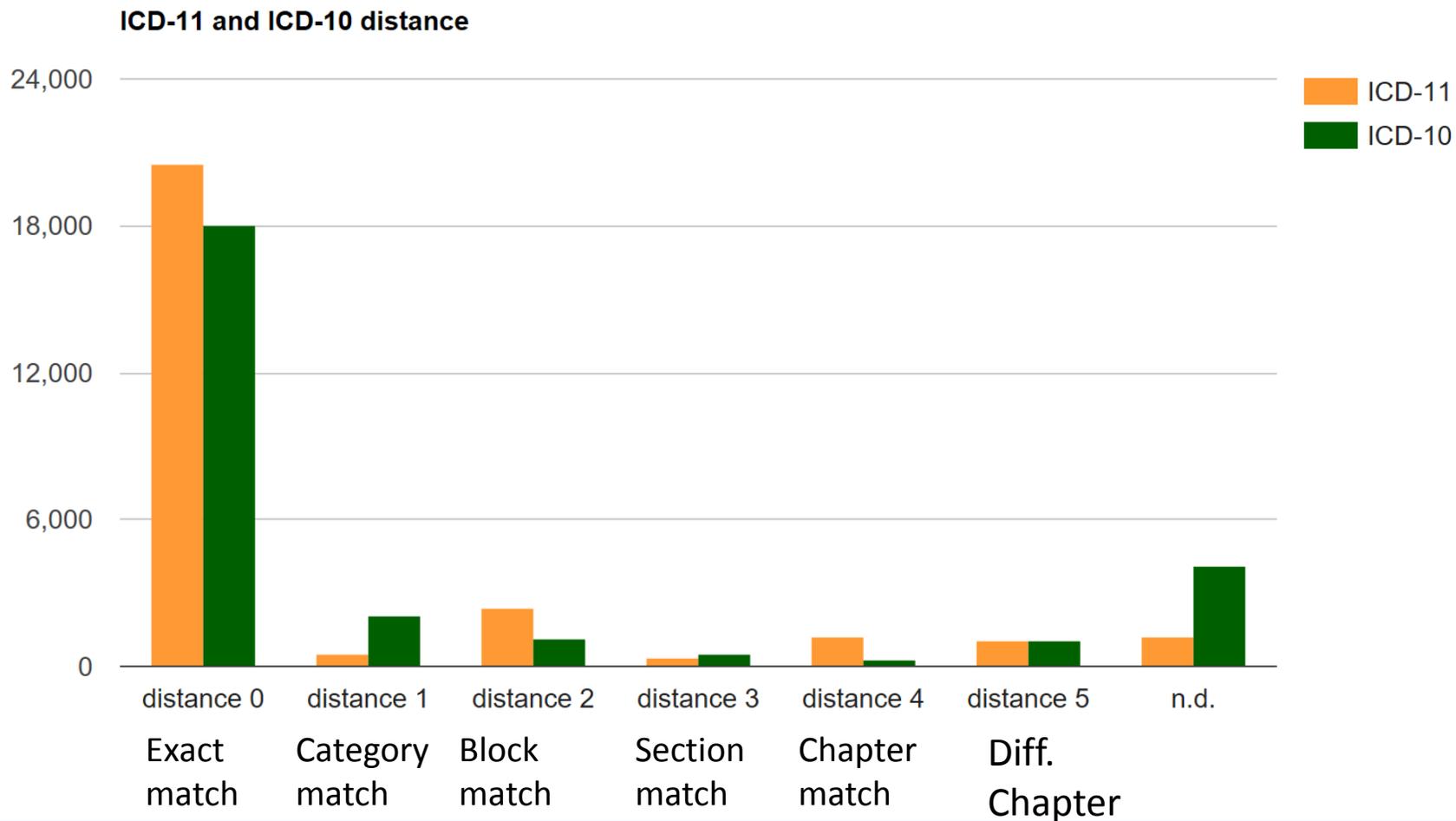
Follow-up action on issues identified in testing

- **Classification issues**
  - *Right breast angiolipoma:* added missing PostC for anatomy and laterality & code for Breast NOS missing
  - *End stage renal failure* added as index term under *GC41.5 Chronic kidney disease, stage 5*

- **Tooling issues**
  - Post-coordination combinations are automatically indexed the following axes
    - Laterality
    - Course (acute /chronic)
    - Specific anatomy

ICD-11 Coding Tool

Left Frontal Glioblastoma

Related words…

Word list
Couldn't find additional matching words

Destination Entities

sort: Matching score

2A00.0 &XK8... **Glioblastoma** of brain [**Left**] [**Frontal** Lobe]

- **Coder issues: awareness & adherence**

1250	Type 2 diabetes mellitus with diabetic foot	223	5A11	82	36.77%
			5A11/BC14	48	21.52%
			BC14	30	13.45%
			BC14/5A11	19	8.52%
			5A14	4	1.79%
			5A11 / BC14	3	1.35%
			Other	37	16.59%

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ICD-11 field implementation assessment tool (ICDfit)

Purpose

- WHO & Member States can check translation and data quality
- ICD coders can test their accuracy in coding with ICD-11
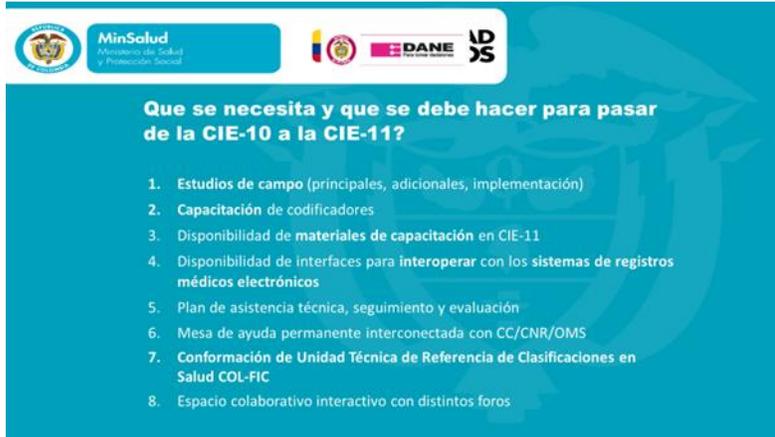
Modules (i.e. set of terms/cases)

- Pre-existing modules:
  - international morbidity module
  - international mortality module
  - custom clinical speciality modules
- Locally defined modules
  - Direct terms-set imported into a module

Analytics

- WHO can assess coding quality and improve classification & tooling
- Coders will get summary score indicating their coding accuracy & timing
- Coders can compare their results with their peers

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Regional consultations on ICD-11 testing and transition preparation

- AMRO/PAHO (Sep 2017)

- EMRO (Aug/Nov 2017)

- EURO (through WHO-FIC CCs in 2017)

- SEARO & WPRO (through WHO-FIC Asia-Pacific Network in 2017)

- AFRO (upcoming)

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ICD Transitions

Trends in cause-of-death reporting by ICD revision

ICD-11 | Belgian Terminology Day | 28 March 2018
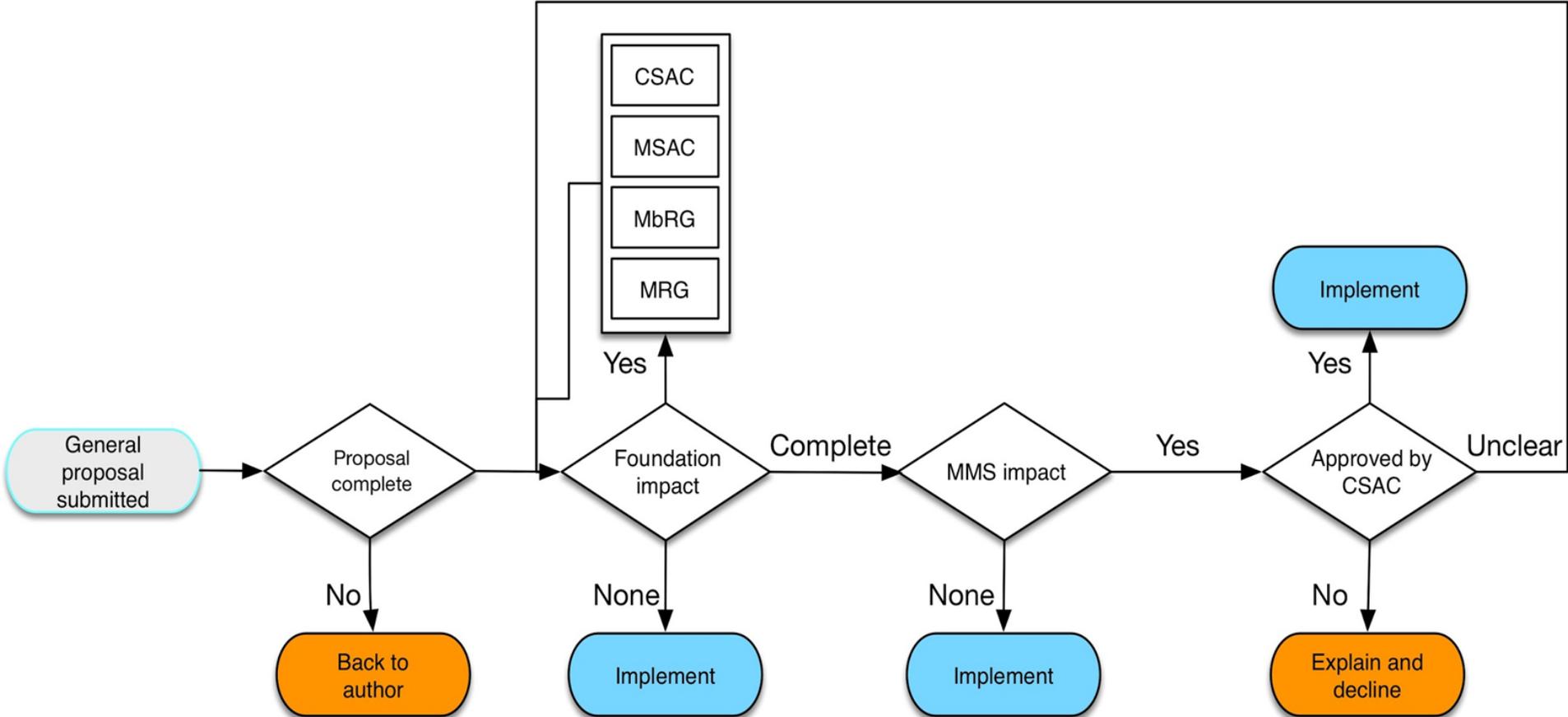
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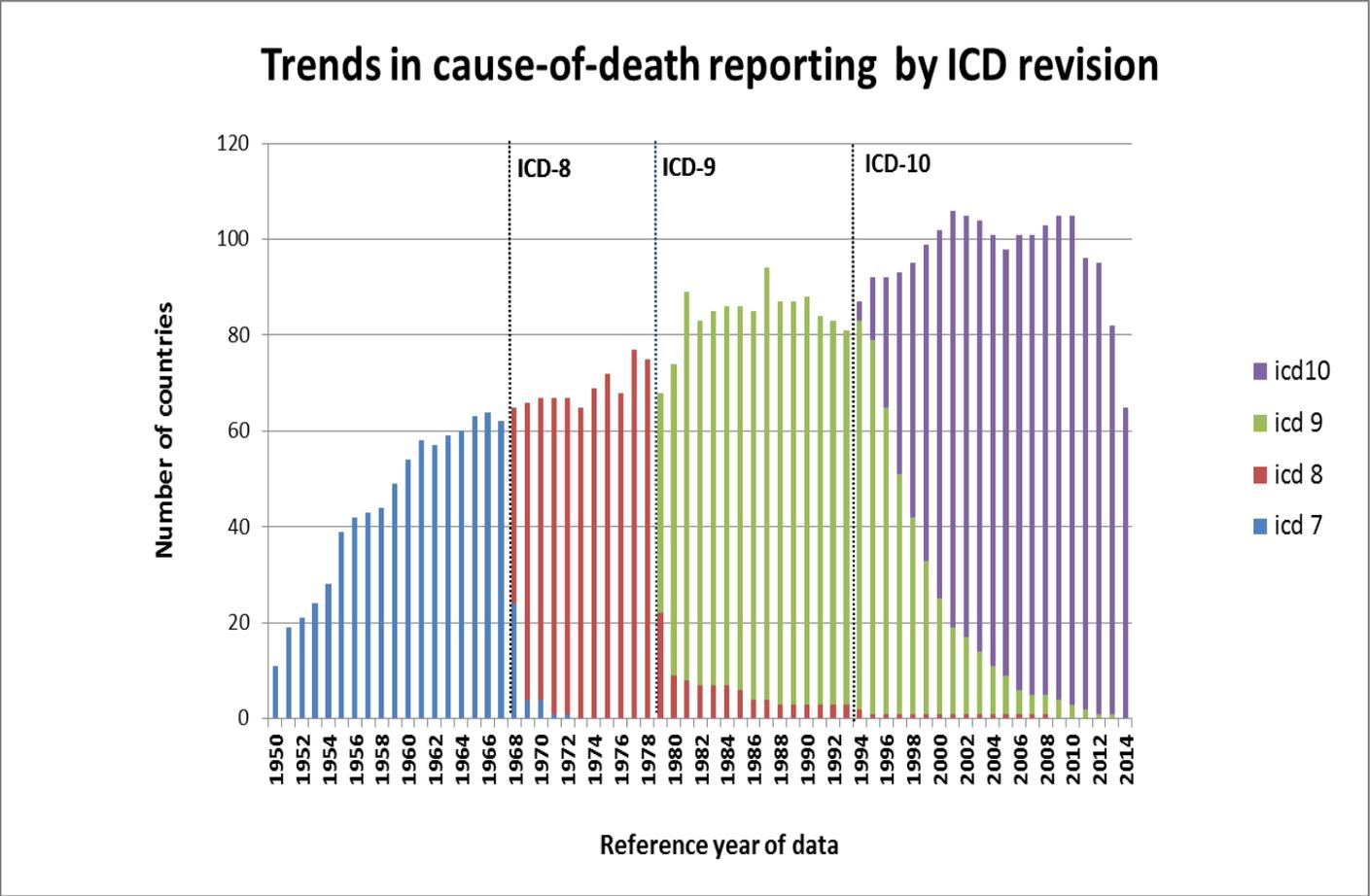
ICD-11 implementation package
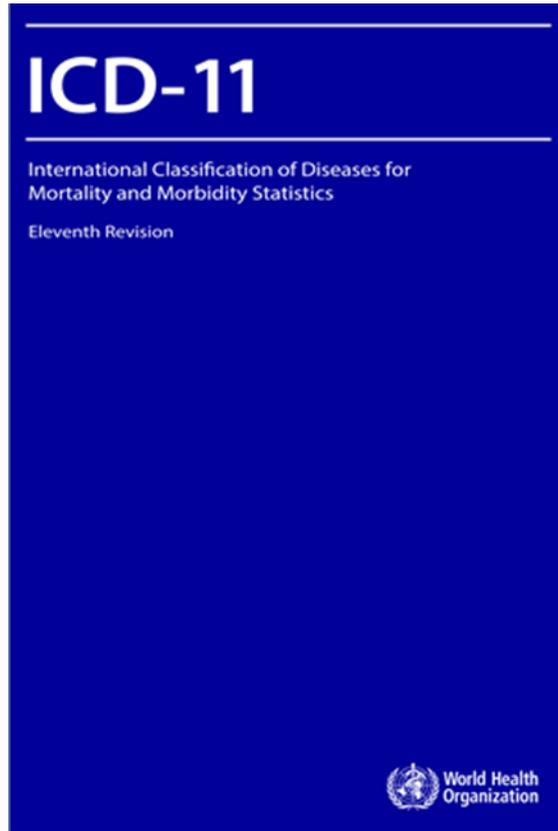
- Advocacy materials
- Training materials
- Transition tables (Maps from and to ICD-10)
- Translation tooling
- ICD-11 field implementation assessment tool (ICDfit)
- Transition Guide
- Maintenance arrangements
- Web Services

ICD - Maintenance

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ICD Revision Process
Status & way forward

2016-17

- Launch of the **ICD-11 2016 version for Member State comment** @ ICD Revision Conference, October 2016 Tokyo, Japan
- **Field testing** in various settings
- **Technical work and tools** continuing

2018-2021

- **Release of the ICD-11 version for implementation** (June 2018);
- **Member States** initiate development of **transition plans**
- **ICD-11 resolution at WHO Executive Board & World Health Assembly 2019**

2022+

- Routine update and maintenance

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Thank you

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