

# Mapping ISO 9999 to ICF in health information systems. The FABER way.

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Giovanni Bassi, Andrea Simoncello, Lucilla Frattura

Central Health Directorate, Classification Area, Friuli Venezia Giulia Region, IT WHO-FIC CC, Udine

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**Abstract** The Italian WHO-FIC CC has developed a web application (FABER) using ICF and other medical terminology systems as a basis for a flexible standards-based electronic bio-psycho-social record. This poster presents the results of the one to many mapping of ISO 9999 to ICF as the solution used by FABER aimed at saving the double need to use the ICF as a standard language and to preserve the ISO 9999 granularity of information.

## Introduction

The Italian WHO-FIC CC has developed a web application (FABER, previously named FBE) using ICF and other medical terminology systems as a basis for a flexible standards-based electronic bio-psycho-social record (1)(2). To create a suitable bio-psycho-social lexicon, information was aligned with a terminology collection containing ICF (3), ISO 9999 (4), national nomenclatures of medical products, and social and health intervention vocabulary. This poster presents the results of the one to many mapping of ISO9999 to ICF as the solution used by FABER aimed at saving the double need to use the ICF as a standard language and to preserve the ISO 9999 granularity of information.

## Methods & Materials

A one to many mapping was performed between the three digit categories of ICF Environmental Factors (EF) Chapter 1 and ISO9999 classes and subclasses. The work was based on the ISO9999-1998 Italian version, as adopted by law in our Country. The mapping of ISO 9999 classification to ICF categories from chapter e1 follows mainly semantic rules. ISO 9999 classification is based on the main function of the products being classified. The ISO 9999 classes were compared with the semantic content of the titles and definitions (including inclusions and exclusions) of ICF categories from chapter e1. In case of ambiguity of ISO 999 classes, the ISO 9999 subclasses and divisions were considered. Firstly, the ISO 9999 classes were analysed, starting from the name and, if necessary, from the definition or explanatory note and/or reference, following rule 5.4.1 of ISO 9999 classification, which states that "a class is equal to the sum of its subclasses and a subclass is equal to the sum of its divisions". This means that if the mapping of a term was not clearly expressed, the mapping of the higher class or subclass has to be considered. When an ISO 9999 class was mapped to more than one ICF category, its subclasses were analysed; the same was done with the ISO 9999 divisions.

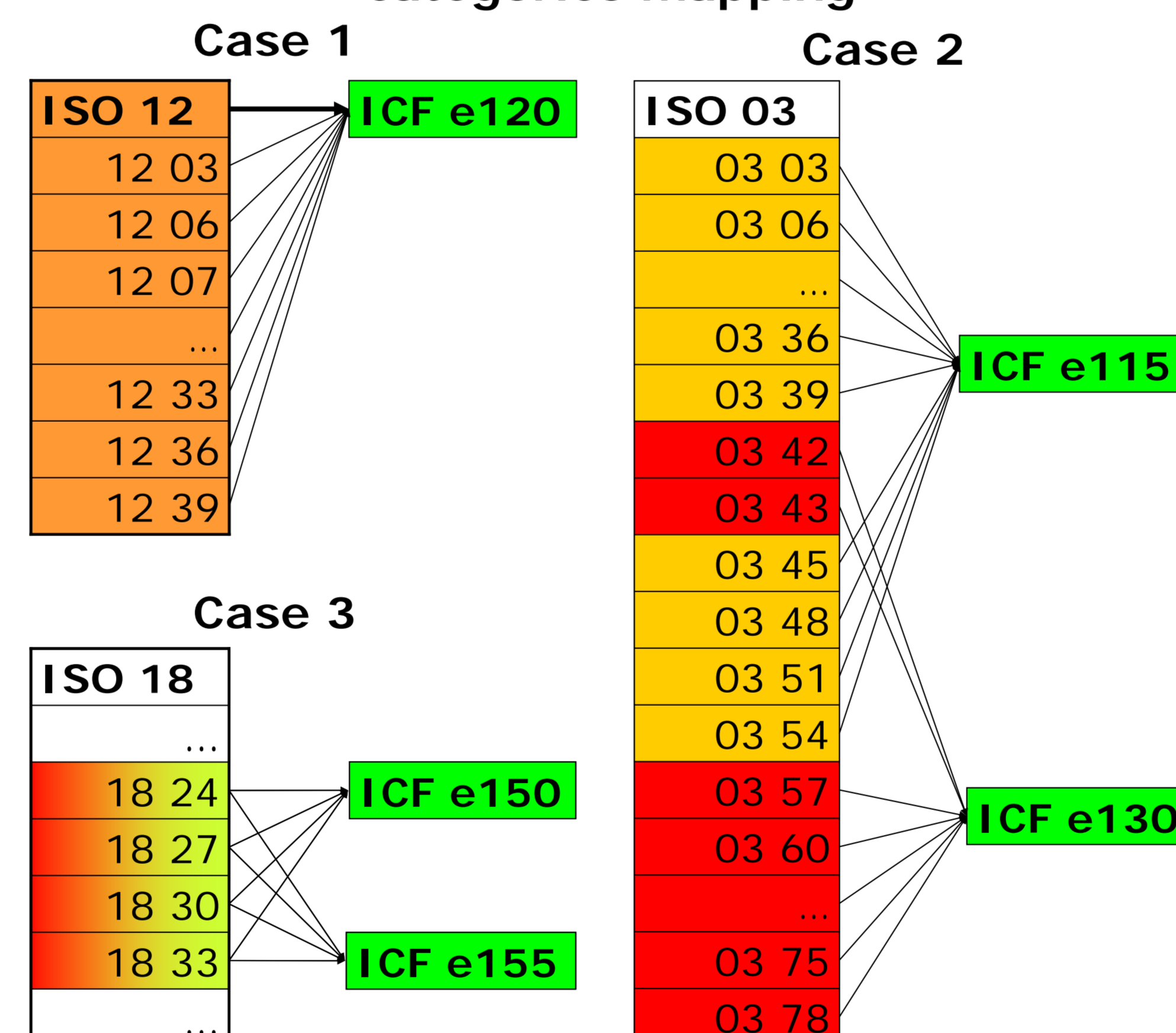
## Results

Four cases occurred (Figure 1):

1. the semantic correspondences between ISO 9999 classes (subclasses and divisions) and ICF categories from chapter e1 are evident, so a ONE TO ONE mapping is explicit. For example, ISO 9999 class 12 "Assistive products for personal mobility" can be mapped to ICF category e120 "Products and technology for personal indoor and outdoor mobility and transportation".

- the ISO 9999 classes contain subclasses that can be semantically mapped to different ICF categories. For example, ISO 9999 class 03 "Ausili per terapia e addestramento", which in general terms can be matched with ICF category e115 "Products and technology for personal use in daily life", contains subclasses that can be mapped to ICF category e130 "Products and technology for education".
- one particular case is that of ISO 9999 class 18 "Furnishings and adaptations to homes and other premises". This class has subclasses that do not exhibit a univocal correspondence with ICF. In fact, ICF makes a distinction between buildings for public use (e150) and buildings for private use (e155), thus it uses two categories. For this reason, we decided to map ISO 9999 terms with both ICF categories.

**Figure 1 – Examples of ISO codes to ICF categories mapping**



- Not all ICF e1 categories were mapped to ISO 9999; furthermore, implantable medical devices, not present in the ISO 9999 but described by other reference terminologies (eg. GMDN - Global Medical Device Nomenclature; Italian CND – National Classification of medical Devices)(5) (6), had already been mapped to the e115 ICF category.

A total amount of 841 ISO 9999 classes were mapped to 8 ICF categories (Table 1). The final mapping is presented by FABER appending the ISO9999 label and code to the ICF code (Table 2).

**Table 1 – Results of mapping ISO9999 to ICF**

ICF category	ISO 9999 classes	Number (%) of overall ISO codes
e115	03, 06, 09, 15, 18, 21, 24, 27, 30	500 (59,5)
e120	12, 18	98 (11,7)
e125	21	125 (14,9)
e130	03	64 (7,6)
e135	24, 27	13 (1,5)
e140	30	21 (2,5)
e150	18	20 (2,4)
e155	18	20 (2,4)
<b>N=8</b>	<b>N=10</b>	<b>841 (100)</b>

**Table 2 – Examples of the Faber way of mapping**

e115	Assistive products for administering medicines (ISO 03 18)
e120	Wheelchairs (ISO 12 21)
e125	Assistive products for seeing (ISO 21 03)
e130	Assistive products for training in the arts (ISO 03 69)
e135	Industrial transportation vehicles (ISO 24 39)
e140	Musical instruments (ISO 30 12)
e150	Assistive products for vertical accessibility (ISO 18 30)
e155	Construction elements in the home and other premises (ISO 18 24)

## Conclusions

In order to describe functioning and disability of a person with a health condition, it is fundamental to collect detailed information about the environment in which he or she lives. Products and Technology listed in the chapter 1 of ICF EF do not assure a precise description of the specific products involved in functioning, due to their poor granularity compared to standard terminologies in use. These standards, adopted by laws and regulations, represent a highly inertial use case with the consequent risk of shadowing the descriptive potential of the ICF. The mapping of ISO 9999 to ICF has not been validated yet by domain experts. However, it has allowed to save the information generated by the use of well-known nomenclatures currently used by Italian health-care workers and to translate them into ICF language. This has been achieved by applying simple mapping rules into information systems. FABER expands the ICF chapter 1, combining redundancy (the same ICF category is replicated many times) and preciseness (the same ICF category is enriched by the specific ISO 9999 code). At the same time, two diverse standards are used jointly and synergically. There are aspects of the use of multiple terminologies and classifications in FABER that deserve further study. One possible development is to create the mapping using the ISO 9999-2011 version (7), given the its backward compatibility. There is also the necessity to describe the built environment, which at the moment is not described by standard nomenclatures or terminologies.

## References

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