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# To kill two birds with one stone: how to automatically combine standard terminologies and nomenclatures with ICF Environmental Factors in epidemiological studies

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Abstract The distribution of expanded ICF-EF terms was analyzed in a sample of 213 outpatients from Region Friuli Venezia Giulia, Italy. Outpatients were selected according to the main healthcare service involved. Almost 200 expanded ICF-EF terms were found (corresponding to 17 ICF-EF items). The distribution of expanded ICF-EF terms in the three groups was different, suggesting a different pattern of the "functioning/disability balance" in these groups. Expanded ICF-EF terms may be useful for epidemiological and statistical purposes.

## Introduction

The ICF provides a functioning descriptive model useful to describe the interactions with individual a health between an condition and his/her contextual factors. A

Table 2: Distribution ISO-9999 codes and ICF fitted items, in different groups (G), according to the electronic ICF-based individual record. Data are presented as number of items coded and percentages (%) on the total number of ICF codes.

	ISO-9999 codes					Expanded ICF-EF	ICF c	Jues			
Codes	Description	G1	G2	G3	Tot			G1	G2	G3	
3 03	Assistive products for respiratory therapy	5	0	4	9	e115 03 03		<u> </u>			-
3 18	Assistive products for administering medicines	2	2	0	4	e115 03 18					
24	Physical, physiological and biochemical test	0	0	1	1	115.02.04					
8 24	equipment and materials	0	0	1	1	e115 03 24					
33	Assistive products for pressure-sore prevention (antidecubitus)	2	0	28	30	e115 03 33					
39	Assistive products for visual training	1	0	0	1	e115 03 39					
8 48	Equipment for movement, strength and balance	7	0	7	14	e115 03 48					
6 03	training Spinal orthoses	3	1	2	6	e115 06 03					
5 12	Lower limb orthotic systems	15	0	10	25	e115 06 12					
5 24	Lower limb prosthetic systems	0	0	1	1	e115 06 24					
30	Prostheses other than limb prostheses	1	2	1	4	e115 06 30					
33	Orthopaedic footwear	10	0	18	28	e115 06 33					
03	Clothes and shoes	1	0	1	2	e115 09 03					
	Assistive products for protecting the body (body-	0									
06	worn)	0	0	6	6	e115 09 06					
12	Assistive products for toileting	0	0	8	8	e115 09 12	e115				
15	Assistive products for tracheostomy care	1	0	0	1	e115 09 15	Products and technology for	78	6	166	
18	Assistive products for ostomy care	1	0	2	3	e115 09 18	personal use in daily living	31.2	2.4	66.4	
21	Products for skin protection and skin cleaning	0	1	1	2	e115 09 21					
24	Urine diverters	0	0	4	4	e115 09 24					
27	Urine collectors	0	0	3	3	e115 09 27					
9 30	Assistive products for absorbing urine and faeces Assistive products for washing, bathing and	8	0	20	28	e115 09 30					
33	showering	1	0	12	13	e115 09 33					
03	Assistive products for preparing food and drink	1	0	0	1	e115 15 03					
09	Assistive products for eating and drinking	1	0	4	5	e115 15 09					
03	Tables	2	0	1	3	e115 18 03					
09	Sitting furniture	12	0	8	20	e115 18 09					
36	Furniture for storage	0	0	1	1	e115 18 36					
09	Assistive products for operating and/or	0	0	2	2	e115 24 09					
	controlling devices	-	-	2	2						
27	Assistive products for fixation	0	0	1	1	e115 24 27					
7 06	Measuring instruments	1	0	0	1	e115 27 06					
06	Games	1	0	0	1	e115 30 06		──			_
2 03	Assistive products for walking, manipulated by one arm	1	1	5	7	e120 12 03					
06	Assistive products for walking, manipulated by both arms	10	0	8	18	e120 12 06					
2 07	Accessories for assistive products for walking	0	0	2	2	e120 1207	e120				
2 12	Car adaptations	3	2	0	5	e120 12 12	Products and technology for				
18	Cycles	2	0	1	3	e120 12 18	personal indoor and outdoor	42	1	86	
21	Wheelchairs	17	0	42	59	e120 12 21	mobility and transportation	32.5	0.8	66.6	
24	Wheelchair accessories	3	0	6	7 4	e120 12 24					
	Vehicles		-	1 7	7	e120 12 27					
30 36	Assistive products for transfer and turning	0 2	0	12	14	e120 12 30					
30 8 18	Assistive products for lifting Support devices	2	0	2	3	e120 12 36 e120 18 18					
03	Assistive products for seeing	10	4	24	38	e125 21 03		╞━━━			=
	Input and output devices for computer,	10	-								
09	typewriters and calculators	1	0	3	4	e125 21 09					
12	Computers	0	0	7	7	e125 21 12					
15	Typewriters and word processing software	0	0	1	1	e125 21 15	e125				
18	Assistive products for calculation	0	0	1	1	e125 21 18	Products and technology for	15	5	38	
24	Assistive products for drawing and writing	0	0	1	1	e125 21 24	communication	25.9	8.6	65.5	
36	Assistive products for telephoning	0	1	0	1	e125 21 36					
42	Assistive products for face-to-face communication	2	0	0	2	e125 21 42					
45	communication Assistive products for hearing	2	0	1	3	e125 21 45					
15	Assistive products for neuring	2	0	-	5	0125 21 45		<u> </u>			-
8 43	Assistive products for training in alternative and augmentative communication	0	0	3	3	e130 03 43	e130 Products and technology for education	0	0	3 100	
09	Work furniture	0	0	1	1	e135 27 09	e135 Products and technology for employment	0	0	1 100	
09	Assistive products for exercise and sports	0	0	1	1	e140 30 09	e140 Products and				Ē
) 12	Musical instruments	1	0	0	1	e140 30 12	technology for culture,	1	0	2	
15	Assistive products for producing photos	0	0	1	1	e140 30 15	recreation and sport	33.3	0	66.7	
2 30	Assistive products for vertical accessibility	1	0	4	5	e150 18 30	e150 Design, construction and building products and technology of building for public use	$\begin{array}{c}1\\20.0\end{array}$	0	4 80.0	
								137	12	299	Í

The distribution of expanded ICF-EF codes was statistically different among groups ( $\chi^2$ test for the difference in the distribution of ICF codes, ELHC codes and Regional Social Information System Services codes P < 0.001), except in Table 2 ( $\chi 2$  test for the difference in the distribution of ICF codes

great novelty is its Environmental Factors (EF) component. Unfortunately, the poor granularity of the EF component of ICF compared to other standard terminologies may discourage its use by those who look for more accuracy or, on the contrary, may facilitate its use by those who need less accuracy. However, standard terminologies do not cover all factors classified by the ICF. Aims: (1) to build expanded ICF-EF terms; (2) to study the distribution of expanded ICF-EF terms in a selected outpatient sample; (3) to suggest the use of expanded ICF-EF terms in epidemiological studies.

Table 1: Distribution of the main uncoded Environmental Factors (EF) defining subjects that provide support, assistance and relationships to the patients, in different groups (G), according to the electronic ICFbased individual record. Data are presented as number of items coded and percentages (%) on the total number of ICF items.

	upport and Re G1	G2	G3	Tot	Expanded ICF-EF		CF codes G1	G2	G3	Tot
Spouse	0	2	9	11	e310 Spouse					201
% Partner	0	0.6 4	2.5 2	3.1 6						
%	0	4 1.1	2 0.6	1.7	e310 Partner					
Father and/or mother	92	33	102	227	-210 E-there are 1/20 models and					
%	25.6	9.2	28.4	63.2	e310 Father and/or mother					
Sibling	5	25	35	65	e310 Sibling	e310	117	69	173	359
% Children	1.4	7.0	9.7 15	<i>18.1</i>	0	Immediate family	35.6	19.2	48.2	100
Children %	0	4 1.1	15 4.2	19 5.3	e310 Children					
Foster/adoptive parent	7	1.1	5	13	e310 Foster/adoptive					
%	1.9	0.3	1.4	3.6	parent					
Grandparent	13	0	5	18	e310 Grandparent					
%	3.6		1.4	5.0						
Medical Doctor	0	7	0	7	e355 Medical Doctor					
% Psychoterapist	0	22.6 3	0	22.6 3						
%	0	9.7	0	9.7	e355 Psychoterapist					
Speech therapist	1	0	0	1	255 Speech therewist	e355		29	1	21
%	3.2			3.2	e355 Speech therapist	Health professionals	2 6.4	28 90.3	$\frac{1}{3.2}$	31 100
Occupational therapist	1	5	0	6	e355 Occupational					
% No	3.2	<i>16.1</i>	1	19.4 14	therapist					
Nurse %	0	13 <i>41.9</i>	1 <i>3.2</i>	14 45.2	e355 Nurse					
Lawyer	0	0	2	2	a260 Lawron					
%	0		9.1	9.1	e360 Lawyer	e360				
Social worker %	0	16 72.7	4 18.2	20 90.9	e360 Social worker	Other professionals	0	16	6	22
		/2./	10.2	<i>J</i> 0. <i>J</i>		<b>x</b> U		72.7	27.3	100
Trustee	0	8	10	18	200 F					
%	-	28.6	35.7	64.3	e330 Trustee					
Employer	0	0	6	6	e330 Employer	e330				•
% Supervisor	0	3	21.4 1	21.4 4		People in position of authorithy	0	11 39.3	17 60.7	28 100
%		10.7	3.6	14.3	e330 Supervisor			07.0	00.7	100
Personal care provider %	0	0	4 20.0	4 20.0	e340 Personal care provider					
∞ Personal assitant	0	11	20.0 5	20.0 16	provider	e340				
	Ŭ		C	10		Personal care providers and	0	11	9	20
%		55.0	25.0	80.0	e340 Personal assitant	personal assistants		55.0	45.0	100
Ex spouse	0	1	0	1	a215 Ex anousa					
%	0	5.3	0	5.3	e315 Ex spouse					
Cousin %	0	4 21.1	0	4 21.1	e315 Cousin					
Nephew/niece	0	1	2	3	e315 Nephew/niece	e315		10	9	19
% Deeth ar in lass	0	5.3 1	10.5	15.8	esis replewineee	Extended family	0	52.6	47.4	100
Brother in law %	0	1 5.3	3 15.8	4 21.1	e315 Brother in law					
Aunt/uncle	0	3	4	7	e315 Aunt/uncle					
% Friend	0	<u>15.8</u> 8	21.1	<u>36.8</u> 12		e320		8	4	12
Friend %	0	8 66.7	4 <i>33.3</i>	12 100	e320 Friend	e320 Friends	0	8 66.7	4 33.3	12
Acquaintance	1	1	1	3	e325 Acquaintance					
% Colleague	16.7 0	16.7 1	16.7 0	50.0 1	1020 requintance					
%	0	1 16.7	0	1 16.7	e325 Colleague	e325 Acquaintances, peers,				
Neighbour	0	1	0	1	e325 Neighbour	colleagues, neighbours and	1 16.7	4 66.6	1 16.7	6 100
% Community member	0	16.7 1	0	16.7 1	0020 Horghoodi	community members	10.7	00.0	10.7	100
Community member %	0	1 16.7	0	1 16.7	e325 Community member					
·		10.7		10.7			120	157	220	405
Total							120	157	220	497
							24.1	31.6	44.3	100

P=0.39). Outpatients in G2, however, represented only the 2.7% of the total ICF codes in Table 2.

#### Conclusions

The expanded granularity of ICF-EF items will allow a more detailed description of the EF underlying an individual functioning profile. The fact that almost 200 expanded ICF-EF codes, out of only 17 ICF-EF items, were used, shows the usefulness to expand the ICF.

The different distribution of expanded ICF-EF terms in the three groups suggests a different pattern of the "functioning/ disability balance" in these groups.

Expanded ICF-EF terms may be useful for epidemiological and statistical purposes.

Table 4: Table 7: Distribution of Regional Social Services Information System terms and ICF fitted items, in different groups (G), according to the electronic ICF-based individual record. Data are presented as number of items coded and percentages (%) on the total number of times ICF e575 code is used.

 $\chi^2$  test for the difference in the distribution of ICF codes = 133.4 P < 0.001

#### Methods & Materials

Specific standard terms concerning care and living environment were collected using international and national nomenclatures and standards (ISO-9999, Italian Essential Levels of Health Care (ELHC), Italian Social Services nomenclature) Care and automatically mapped to ICF. Then, expanded ICF-EF terms were obtained that had the ICF code in first coding position and the standard nomenclature term in second coding position. The expanded ICF-EF terms were then used to collect data on a sample of 213 outpatients selected according to the main healthcare service involved (Child and Adolescent Neuropsychiatry Services, No. = 53; Mental Health Departments, No. = 51; and Healthcare Districts, No. = 109).

### Results

Expanded ICF-EF related terms to outpatients sample almost 200 were compared to 17 ICF-EF items. Twenty-nine ICF-uncoded family members, health and social professionals, trustees, colleagues friends found and were (corresponding to 8 ICF items in e3)[Table 1]. Fifty-six ICF-ISO-9999 codes were found (corresponding to 7 ICF-EF e1 categories) [Table 2].

Twenty-five different ICF-ELHC terms were found (corresponding to ICF code e580) [Table 3]. Eighty ICF-Italian Social Care Services terms were found (corresponding) to ICF code e575)[Table 4].

Table 3: Distribution of Essential Levels of Health Care (ELHC) terms and ICF fitted items, in different groups (G), according to the electronic ICF-based individual record. Data are presented as number of items coded and percentages (%) on the total number of ICF e580 code.

	ELHC terms					Expanded ICF-EF		ICF o	code		
Codes*	Description	G1	G2	G3	Tot			G1	G2	G3	
.A-1.F	Services targeted to the population at large and the working community	5	3	3	11	e580 1.		173 25.9	209 31.3	286 42.8	
	%	0.7	0.4	0.4	1.6						
	District health care services										
2.A	Basic health care services	24	28	51	103	e580 2.A					
	%	24 3.6	4.2	7.6	15.4						
2.B	Local emergency response				_	e580 2.B					
-12	%	3 0.4	2 0.3	2 0.3	7 1.0						
2.C	Pharmaceutical services provided through licensed local pharmacies	12	21	45	70	e580 2.C					
	%	13 1.9	21 <i>3.1</i>	45 6.7	79 11.8						
2.D	Supplementary health care support	4	1	6	11	e580 2.D					
	%	0.6	0.1	0.9	1.6		e580 Health				
2.E	Specialist day-hospital services	36	24	35	95	e580 2.E	services,				
	%	5.4	24 3.6	55 5.2	93 14.2		systems and				
							policies				
2.F	Provision of prostheses	17	0	23	40	e580 2.F					
	%	2.5		3.4	6.0						
2.G	Local day-hospital and home-based services	36	63	58	157	e580 2.G					
	%	5.4	03 9.4	38 8.7	23.5						
2.H	Local health care services provided in residential and semi- residential support facilities					e580 2.H					
		12 1.8	56 8.4	52 7.8	120 18.0						
	%										
.A-3.I	Hospital services	21	7	8	36	e580 3.					
	%	3.1	1.0	1.2	5.4						
	Services targeted to care and rehabilitation of non self-					o590.4					
	sufficient persons	2	4	3	9	e580 4.					
	%	0.3	0.6	0.4	1.3						
	, o										

<b>Regional Social Services</b>	Inforn	nation	System	codes	Expanded ICF-EF	ICF code					
Description	G1	G2	G3	Tot			G1	G2	G3	Tot	
Interventions for access to Social Service <sup>a</sup>	7	0	2	9	e575 Interventions for access to Social Service						
%	6.1		1.8	7.9							
Social work <sup>b</sup>		4	9	23	e575 Social work						
%	8.8	3.5	7.9	20.2							
Economical support interventions <sup>c</sup>	8	16	11	35	e575 Economical support interventions						
%	7.0	14.0	9.6	30.7		e575	10	20	10		
Residential services <sup>d</sup>	11	6	7	24	e575 Residential services	General social support services, system and	42 36.8	30 26.3	42 36.8	114 100	
%	9.6	5.3	6.1	21.1		policies	2 010	2010	0010	200	
Semi-residential and social skill nterventions <sup>e</sup>	5	3	12	20	e575 Semi-residential and social skill interventions						
%	4.4	2.6	10.5	17.5							
Family care and institutional care <sup>f</sup>	1	1	1	3	e575 Family care and institutional care						
%	0.9	0.9	0.9	2.6							

\*Housing services and activities supporting the access to employment were excluded, due to the lack of codes in this category

<sup>a</sup> Interventions addressed to the user that are adopted immediately after contact with social services

Services provided by social services professionals Interventions providing economical support to single users and/or families, based on national and/or regional regulations, and/or absence of or insufficient income, and of evident social difficultie

and/or risk of social marginalization

terventions aimed at ensuring home care, meant as a basic individual right and, more extensively, as a meaningful space. The concept refers to the user's home - place of memory and of material and immaterial objects linked to user and user's family personal history and to his/her routine. This concept may be expanded to social relationships, nature, landscape, culture, community history e Integrated services provided to families that need specialist support. These interventions provide daily stay in residential facilities (24h care) for elderly, immigrants, disabled people, persons underage, etc.; daily care centers; and temporary residential facilities providing accommodation, health care, recreational services, etc

<sup>f</sup>Replacement services addressed to families unable or inadequate to perform, permanently or temporarily, their duties. Interventions providing permanent stay in 24h care facilities, such as residential facilities for self-sufficient persons with social difficulties that cannot be dealt with at home, and community and housing facilities providing social and health care

 $\chi^2$  test for the difference in the distribution of Regional Social Services Information System codes = 20.8 P < 0.001

#### References

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\*Code 2.I (Spa water services) was excluded, due to the lack of codes in this category  $\chi^2$  test for the difference in the distribution of ELHC codes = 24.43 P < 0.001

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