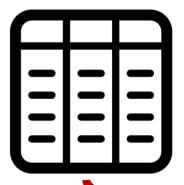
www.github.com/scandat/importicd

Patient



PatientID
Country
Birthdate
Sex
DeathDate
MigDate

Diagnosis



PatientID
Diagnosis
ICD_version
Country
DiagnosisDate

Outcomes



The Problem

```
(a.country='S' and
                     (b.icd=10 and
                     ((substring(b.diagnosis, 1, 4) = 'A812') or (substring(b.diagnosis, 1, 3) = 'B45') or
                     (substring (b.diagnosis, 1, 4) = 'J172') or (substring (b.diagnosis, 1, 4) = 'B485') or
                     (substring (b.diagnosis, 1, 4) = 'B250') or (substring (b.diagnosis, 1, 4) = 'B250') or
                     (substring(b.diagnosis, 1, 4) = 'B251') or (substring(b.diagnosis, 1, 4) = 'B252') or
                     (substring(b.diagnosis,1,4)='B258') or (substring(b.diagnosis,1,4)='B259') or
                     (substring (b.diagnosis, 1, 3) = 'B58') or (substring (b.diagnosis, 1, 3) = 'A17') or
                     (substring(b.diagnosis,1,3)='A18') or (substring(b.diagnosis,1,3)='A19') or
                     (substring(b.diagnosis,1,3)='B02') or (substring(b.diagnosis,1,3)='B37') or
                     (substring (b.diagnosis, 1, 3) = 'B44') or (substring (b.diagnosis, 1, 3) = 'B38') or
                     (substring(b.diagnosis,1,3)='B39') or (substring(b.diagnosis,1,3)='B40') or
                     (substring (b.diagnosis, 1, 3) = 'B41') or (substring (b.diagnosis, 1, 3) = 'B42') or
                     (substring(b.diagnosis,1,3)='B43') or (substring(b.diagnosis,1,3)='B45') or
                     (substring(b.diagnosis,1,3)='B46') or (substring(b.diagnosis,1,3)='B47') or
                     (substring(b.diagnosis, 1, 4) = 'B487') or (substring(b.diagnosis, 1, 4) = 'J172') or
                     (substring (b.diagnosis, 1, 3) = 'J13') or (substring (b.diagnosis, 1, 3) = 'J14') or
                     (substring(b.diagnosis,1,3)='J15') or (substring(b.diagnosis,1,3)='J01') or
                     (substring(b.diagnosis,1,3)='A30') or (substring(b.diagnosis,1,3)='A31') or
                     (substring(b.diagnosis,1,3)='A32') or (substring(b.diagnosis,1,3)='A33') or
                     (substring (b.diagnosis, 1, 3) = 'A34') or (substring (b.diagnosis, 1, 3) = 'A35') or
                     (substring(b.diagnosis,1,3)='A36') or (substring(b.diagnosis,1,3)='A37') or
                     (substring(b.diagnosis,1,3)='A38') or (substring(b.diagnosis,1,3)='A39') or
                     (substring (b.diagnosis, 1, 3) = 'A40') or (substring (b.diagnosis, 1, 3) = 'A41') or
                     (substring(b.diagnosis,1,3)='A42') or (substring(b.diagnosis,1,3)='A43') or
                     (substring (b.diagnosis, 1, 3) = 'A44') or (substring (b.diagnosis, 1, 3) = 'A45') or
                     (substring(b.diagnosis,1,3)='A46') or (substring(b.diagnosis,1,3)='A47') or
                     (substring(b.diagnosis,1,3)='A48') or (substring(b.diagnosis,1,3)='A49') or
                     (substring(b.diagnosis,1,4)='R572') or (substring(b.diagnosis,1,4)='R651'))
                    (b.icd=9 and
                     ((substring(b.diagnosis, 1, 4) = '046D') or (substring(b.diagnosis, 1, 4) = '117F') or
                     (substring (b.diagnosis, 1, 4) = '136D') or (substring (b.diagnosis, 1, 4) = '078F') or
                     (substring (b.diagnosis, 1, 4) = '484B') or (substring (b.diagnosis, 1, 3) = '130') or
                     (substring(b.diagnosis,1,3)='031') or (substring(b.diagnosis,1,3)='010') or
                     (substring (b.diagnosis, 1, 3) = '012') or (substring (b.diagnosis, 1, 3) = '013') or
                     (substring (b.diagnosis, 1,3) = '014') or (substring (b.diagnosis, 1,3) = '015') or
                     (substring(b.diagnosis,1,3)='016') or (substring(b.diagnosis,1,3)='017') or
                     (substring(b.diagnosis,1,3)='018') or (substring(b.diagnosis,1,3)='053') or
                     (substring (b.diagnosis, 1, 4) = '112A') or (substring (b.diagnosis, 1, 4) = '112D') or
                     (substring (b.diagnosis, 1, 4) = '112E') or (substring (b.diagnosis, 1, 4) = '112F') or
                     (substring (b.diagnosis, 1, 4) = '112W') or (substring (b.diagnosis, 1, 4) = '112X') or
                     (substring (b.diagnosis, 1, 4) = '117D') or (substring (b.diagnosis, 1, 3) = '114') or
                     (substring(b.diagnosis,1,3)='115') or (substring(b.diagnosis,1,3)='116') or
                     (substring (b.diagnosis, 1, 4) = '117E') or (substring (b.diagnosis, 1, 4) = '117X') or
                     (substring (b.diagnosis, 1, 3) = '118') or (substring (b.diagnosis, 1, 3) = '481') or
                     (substring (b.diagnosis, 1, 3) = '482') or (substring (b.diagnosis, 1, 3) = '461') or
                     (substring(b.diagnosis,1,3)='034') or (substring(b.diagnosis,1,3)='035') or
                     (substring(b.diagnosis,1,3)='036') or (substring(b.diagnosis,1,3)='038') or
                     (substring(b.diagnosis,1,4)='041X') or (substring(b.diagnosis,1,4)='790H') or
                     (substring(b.diagnosis,1,3)='040') or (substring(b.diagnosis,1,3)='041'))
                     );
                     quit;
```

```
%macro group(supergroup, groupname, fulltext, icd);
if %i(diagnosis,&icd) then do;
                    supergroup=&supergroup;
                    group=&groupname;
                    grouptext=&fulltext;
%mend;
Data InfOutcomes2;
set InfOutcomes;
if icd=9 then do;
                    %group('Opportunistic', 'PML', 'PML/JC virus', 046D)
                    %group('Opportunistic','Crypto','Cryptococcus',117F)
                    %group('Opportunistic', 'PCP ', 'PCP ', 136D)
                    %group('Opportunistic','CMV','CMV',078F 484B)
                    %group('Opportunistic','Toxoplasma','Toxoplasma',130)
                    %group('Opportunistic','Mycobacteria','Disseminated mycobacteria',031 010 012 013 014 015 016 017 018)
                    %group('Opportunistic','Candida','Candida',112A 112D 112E 112F 112W 112X)
                    %group('Opportunistic', 'Aspergillus', 'Aspergillus', 117D)
                    %group('Opportunistic','Fungal','Invasive Fungal infections',114 115 116 117E 117X 118)
                    %group('Common', 'Pneumonia', 'Bacterial pneumonia', 481 482)
                    %group('Common', 'Sinuisitis', 'Sinusitis', 461)
                    %group('Common','SepsisBacInf','Sepsis / other bacterial infection',034 035 036 038 041X 790H 040 041)
                    %group('Common', 'Shingles', 'Shingles', 053)
end:
if icd=10 then do;
                    %group('Opportunistic', 'PML', 'PML/JC virus', A812)
                    %group('Opportunistic', 'Crypto', 'Cryptococcus', B45)
                    %group('Opportunistic', 'PCP ', 'PCP ', J172 B485 B206)
                    %group('Opportunistic', 'CMV', 'CMV', B250 B251 B252 B258 B259)
                    %group('Opportunistic','Toxoplasma','Toxoplasma',B58)
                    %group('Opportunistic','Mycobacteria','Disseminated mycobacteria',A17 A18 A19)
                    %group('Opportunistic','Candida','Candida',B370 B371 B372 B375 B376 B377 B378 B379)
                    %group('Opportunistic', 'Aspergillus', 'Aspergillus', B44)
                    %group('Opportunistic', 'Fungal', 'Invasive Fungal infections', B38 B39 B40 B41 B42 B43 B46 B47 B487)
                    %group('Common', 'Pneumonia', 'Bacterial pneumonia', J13 J14 J15)
                    %group('Common', 'Sinuisitis', 'Sinusitis', J01)
                    %group('Common','SepsisBacInf','Sepsis / other bacterial infection',A30 A31 A32 A33 A34 A35 A36 A37 A38
A39 A40 A41 A42 A43 A44 A45 A46 A47 A48 A49 R572 R651 )
                    %group('Common', 'Shingles ', 'Shingles ', B02)
if missing(group) then delete;
```

The Problem

Many standard solutions don't work

- Vanilla joins don't work if you have varying levels of ICD codes
- "LIKE" is slow and you can't join on "LIKE" in Proc SQL
- You can join on FIND but it's slow, and you still need to create a new table to join with every time you change something
- SAS alternatives like "in:" don't work on SQL servers

What we wanted

- Single source of truth
- Easy to edit
- Easy to review
- Easy to discuss
- Easy to publish
- Look neat

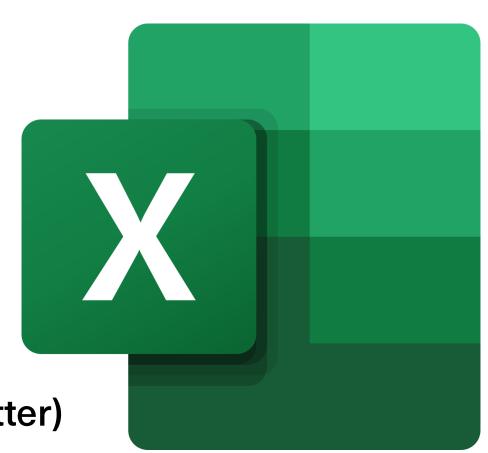
Other considerations

- Should be easy to share and discuss with non-coders
- Reusability for other projects

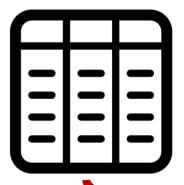
Why we chose Excel

- Universally available
- Easy for data entry
- Easy to handle with SAS

(However, version control could be better)



Patient



PatientID
Country
Birthdate
Sex
DeathDate
MigDate

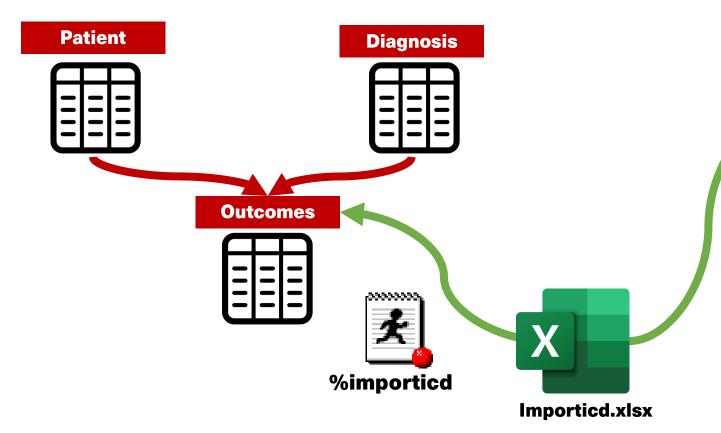
Diagnosis



PatientID
Diagnosis
ICD_version
Country
DiagnosisDate

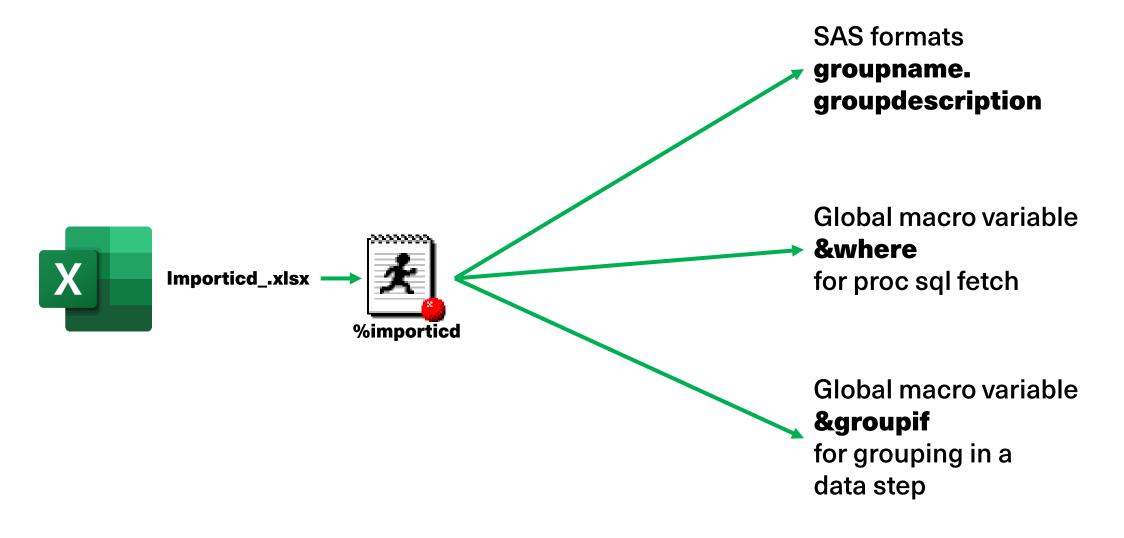
Outcomes





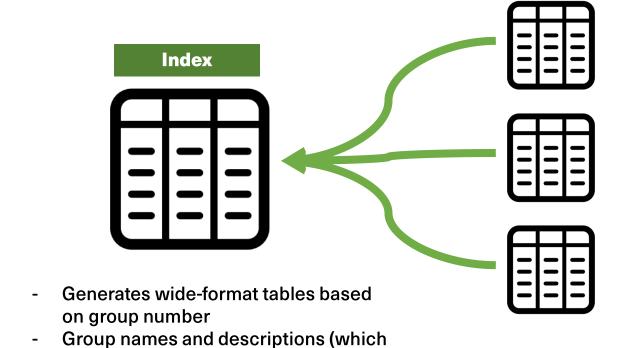
sentification				
Discoses		ICD-8	ICD-9	SCD-10
It stress related disorder PTSD		327, 306.4	309, 308 3098	P40.1
Acids stream reaction			309A 301	F43.0
Adjustment disorder			309X	F43.2
Other stress reaction my psychiatric disorder		290,245	309X 290_315	F43.9, F43.9
ny psychiatric d elisimmune dise		290-315	290-315	P
teenes of	Distrates melitius, insulin dependent	210	250	E10
ndocrina yalem		24200 24209	342A, 242X, 24465.	E03.5, E03.9, E05.0
	Autoimmune thyroid disease	244, 245.03	244X, 249C.	EDS 5, EDS.9, EDS.3, EDB.5
	Addedn's disease	255.1	2555	E27.1, E27.2
	Autoimmune polygianduler syndrome	258.10	2588	521.0
diamenatory ribetta ancultra	Reactive arthritis (Reiter's syndrome)	712.00, 712.10.	8990, 711A	M02.3, ME2.6, M02.9 M05, M06, M06.0.
	Rheumatoid orthritis	712.20, 712.39, 712.30	714A-D, 719D	M08.1, M08.2, M08.3, M08.4
	Anistoning spondytte Polyariaritis nodows and related condition	712.4	T20A	M45
	(Incl. Kawasani, Churg-Strauss syndroms, etc.)	446	446A, 446B	N30
	Thrombotic microengiopathy		4460	M01.1
	Granulomatosis with polyangillis (Viegenera's granulomatosis)	446.20	446E	M31.3
	Mercacopic polyangitis	287.00	267A	M31.7 DISR.0
	Henoch-Schonlein purgura	846.30 446.31.44		
	Gent cell effects/ Polymyelgia dwumatice	6.39,717.9	440F, 725	M35.3, M31.5, M31.6
onnetive unus disceters	Systemic lupus erythematosus	734.1	TYDA	M32 M33 0, M33 1, M33 2
	Polymycelta/dermatomycelta	716.10, 716.00	7100,7100	M33.0, M33.1, M33.2, M33.0
	Systematic ackrosis (sclaroderma) Sidoron's sundrone	7100,7340	7108 7100	M34 M35.0
	Mixed corrective topus diagram	734.90, 734.91,	710X-710W	M35.1
	Sehcet's syndrome	734.99 136.0	1365	M35.2
teases of skin patern	Permitigue volgarie	594 DD	4945	110.0
	fluffour perrorhopoil	894.05	6047	1.12
	Dermattle herpetfornia Psociesia	693.99	6964 696E	113.0
	Atiperie arcete	704.00	704A	L64
	\98g2	709.06	709A	L90
ematological iseases teases of	Pernicious anemie	281.0	281A	D61.0
	Autoimmune hemolytic anemia Magathic thrombocylopenic purpura	283.90, 283.92 287.3	263A 2670	D59.0, D59.1 D69.3
	Acute disseminated and aphalomyeltis	297.5	2670	CODA
errous system	Anti-NMDA receptor encephalitis			G13.1
	Multiple actorosis	340	340	G35
	Heuromyellis optice and ADEM	341	341A	036 061.0, 061.1, 061.5.
	Guillen-Bané syndrome	354.01	357A	G61.9
	Myserbaria gravis Premary bilany certonia	F33.0	388A 671G	G70.0 K74.3
igestive ystem	Crohrry diameter	563.00	5719	K74.3
	Ulcerative coltis	563.10, 569.02	556	KS1
	Coelec disease	269 00, 269 96	5794	KB0.0
there	Acute rheamatic fever and choses	390-392	399-312	100, 101.0, 101.1, 101.2, 101.8, 101.9, 102.0, 102.0
	Sercoidosis	135	135	D88

Overview of importicd



Overview of importicd.xlsx

become SAS formats)



ICD codes

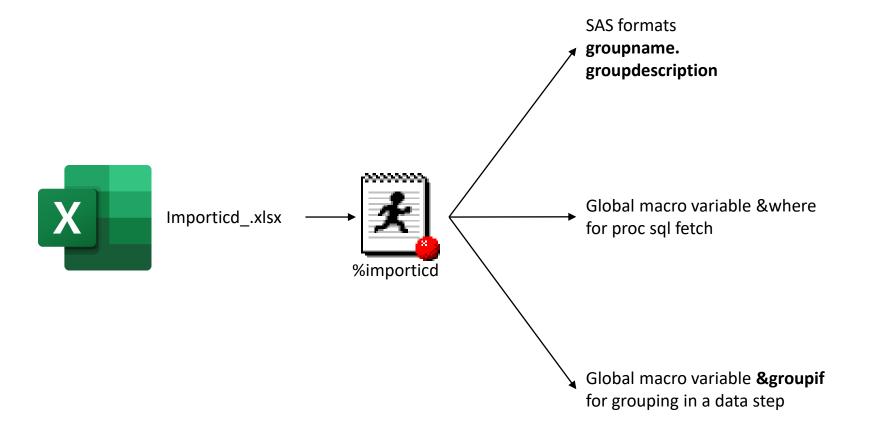
- Long format
- One sheet per version + country
- Sort by group number
- Fetches descriptions

www.github.com/scandat/importicd

Demo

extra slides

Overview of importicd



Format names can be customized using the 'formatname=' option, e.g. when you want to use multiple %importicd instances

Option 'mode' can either 'local' or 'passthrough', which affects the substring command.

By default the diagnosis variable is b.diagnosis, and this can be changed in the diavar option.

%importicd

The SAS macro %importicd and the excel sheet importicd_template.xlsx aim to achieve the following:

- Facilitate updating and documenting ICD-codes
- Minimize the chance of errors in lengthy SAS programs containing ICD codes
- Minimize effort to create publication-ready wide-format ICD-code tables

The excel file contains the following sheets:

- INDEX
 - Define group name and description which will be used to create SAS formats
 - Automatically generated wide-format tables
- ICDxSE/DK
 - Sheets for ICD7-10 for SE and DK (entries need to be sorted by group number)
 - ICD9SE and ICD10SE can fetch descriptions from hidden tables

Example output

%importicd("...\importicd template.xlsx", 7SE 8SE 10SE 7DK 8DK,mode=local);

```
%put &where;
(a.country='S' and (b.icd=7 and
( (substring(b.diagnosis.1.5)='7SE 1') or
(substring(b.diagnosis,1,5)='7SE 2') or (substring(b.diagnosis,1,5)='7SE 3') or
(substring(b.diagnosis,1,5)='7SE 4') or (substring(b.diagnosis,1,5)='7SE 5') or
(substring(b.diagnosis,1,5)='7SE 6') or (substring(b.diagnosis,1,5)='7SE 7') or
(substring(b.diagnosis,1,5)='7SE 8'))))
or (a.country='S' and (b.icd=8 and (
(substring(b.diagnosis,1,5)='8SE 1') or (substring(b.diagnosis,1,5)='8SE 2') or
(substring(b.diagnosis,1,5)='8SE 3') or (substring(b.diagnosis,1,5)='8SE 4') or
(substring(b.diagnosis,1,5)='8SE 5') or (substring(b.diagnosis,1,5)='8SE 6') or
(substring(b.diagnosis.1.5)='8SE 7') or (substring(b.diagnosis.1.5)='8SE 8'))))
or (a.country='S' and (b.icd=10 and
((substring(b.diagnosis,1,6)='10SE 1') or (substring(b.diagnosis,1,6)='10SE 2') or
(substring(b.diagnosis,1,6)='10SE 3') or (substring(b.diagnosis,1,6)='10SE 4') or
(substring(b.diagnosis.1.6)='10SE 5') or (substring(b.diagnosis.1.6)='10SE 6') or
(substring(b.diagnosis,1,6)='10SE_7') or (substring(b.diagnosis,1,6)='10SE_8'))))
or (a.country='D'and (b.icd=7 and
((substring(b.diagnosis,1,5)='7DK 1') or (substring(b.diagnosis,1,5)='7DK 2') or
(substring(b.diagnosis.1.5)='7DK 3') or (substring(b.diagnosis.1.5)='7DK 4') or
(substring(b.diagnosis,1,5)='7DK 5') or (substring(b.diagnosis,1,5)='7DK 6') or
(substring(b.diagnosis,1,5)='7DK 7') or (substring(b.diagnosis,1,5)='7DK 8'))))
or (a.country='D' and(b.icd=8 and
((substring(b.diagnosis.1.5)='8DK 1') or (substring(b.diagnosis.1.5)='8DK 2') or
(substring(b.diagnosis,1,5)='8DK 3') or (substring(b.diagnosis,1,5)='8DK 4') or
(substring(b.diagnosis,1,5)='8DK 5') or (substring(b.diagnosis,1,5)='8DK 6') or
(substring(b.diagnosis.1.5)='8DK 7') or (substring(b.diagnosis.1.5)='8DK 8'))))
```

```
%put &groupif;
if country="S" and icd=7 then do;
if (0 or (substr(diagnosis,1,5)="7SE 1")) then group=1;
if (0 or (substr(diagnosis.1.5)="7SE 2")) then group=1:
if (0 or (substr(diagnosis,1,5)="7SE 3")) then group=2;
if (0 or (substr(diagnosis,1,5)="7SE 4")) then group=3;
if (0 or (substr(diagnosis,1,5)="7SE 5")) then group=4;
if (0 or (substr(diagnosis,1,5)="7SE 6")) then group=4;
if (0 or (substr(diagnosis.1.5)="7SE 7")) then group=4:
if (0 or (substr(diagnosis, 1,5) = "7SE 8")) then group=4; end;
if country="S" and icd=8 then do;
if (0 or (substr(diagnosis,1,5)="8SE 1")) then group=1;
if (0 or (substr(diagnosis.1.5)="8SE 2")) then group=1;
if (0 or (substr(diagnosis,1,5)="8SE 3")) then group=2;
if (0 or (substr(diagnosis,1,5)="8SE 4")) then group=3;
if (0 or (substr(diagnosis,1,5)="8SE 5")) then group=4;
if (0 or (substr(diagnosis,1,5)="8SE 6")) then group=4;
if (0 or (substr(diagnosis.1.5)="8SE 7")) then group=4:
if (0 or (substr(diagnosis, 1,5) = "8SE 8")) then group=4; end;
if country="S" and icd=10 then do;
if (0 or (substr(diagnosis, 1, 6) = "10SE 1")) then group=1;
if (0 or (substr(diagnosis.1.6)="10SE 2")) then group=1;
if (0 or (substr(diagnosis, 1,6) = "10SE 3")) then group=2;
if (0 or (substr(diagnosis, 1, 6) = "10SE 4")) then group=3;
if (0 or (substr(diagnosis, 1,6) = "10SE 5")) then group=4;
if (0 or (substr(diagnosis, 1,6) = "10SE 6")) then group=4;
if (0 or (substr(diagnosis.1.6)="10SE 7")) then group=4:
if (0 or (substr(diagnosis,1,6)="10SE 8")) then group=4; end;
if country="D" and icd=7 then do;
if (0 or (substr(diagnosis,1,5)="7DK 1")) then group=1;
if (0 or (substr(diagnosis.1.5)="7DK 2")) then group=1;
if (0 or (substr(diagnosis,1,5)="7DK 3")) then group=2;
if (0 or (substr(diagnosis, 1, 5) = "7DK 4")) then group=3;
if (0 or (substr(diagnosis,1,5)="7DK 5")) then group=4;
if (0 or (substr(diagnosis,1,5)="7DK 6")) then group=4;
if (0 or (substr(diagnosis.1.5)="7DK 7")) then group=4:
if (0 or (substr(diagnosis,1,5)="7DK 8") ) then group=4; end;
if country="D" and icd=8 then do;
if (0 or (substr(diagnosis,1,5)="8DK 1")) then group=1;
if (0 or (substr(diagnosis.1.5)="8DK 2")) then group=1;
if (0 or (substr(diagnosis,1,5)="8DK 3")) then group=2;
if (0 or (substr(diagnosis,1,5)="8DK 4")) then group=3;
if (0 or (substr(diagnosis,1,5)="8DK 5")) then group=4;
if (0 or (substr(diagnosis, 1,5) = "8DK 6")) then group=4;
if (0 or (substr(diagnosis.1.5)="8DK 7")) then group=4;
if (0 or (substr(diagnosis, 1,5) = "8DK 8")) then group=4; end;
```