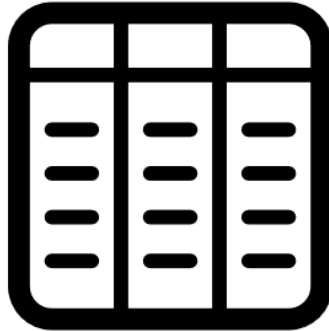


www.github.com/scandat/importcd

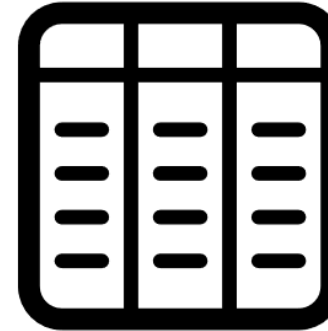
Patient



—	—	—
—	—	—
—	—	—
—	—	—

PatientID
Country
Birthdate
Sex
DeathDate
MigDate

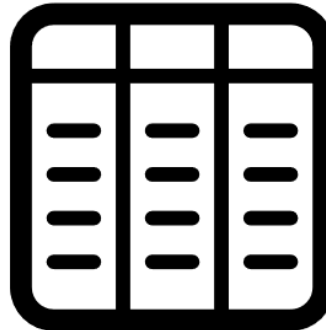
Diagnosis



—	—	—
—	—	—
—	—	—
—	—	—

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)='B206') 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'))
)
or
(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;
    groupext=&fulltext;
end;

%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','Sinusitis','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','Sinusitis','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)

end;
if missing(group) then delete;
run;
```

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

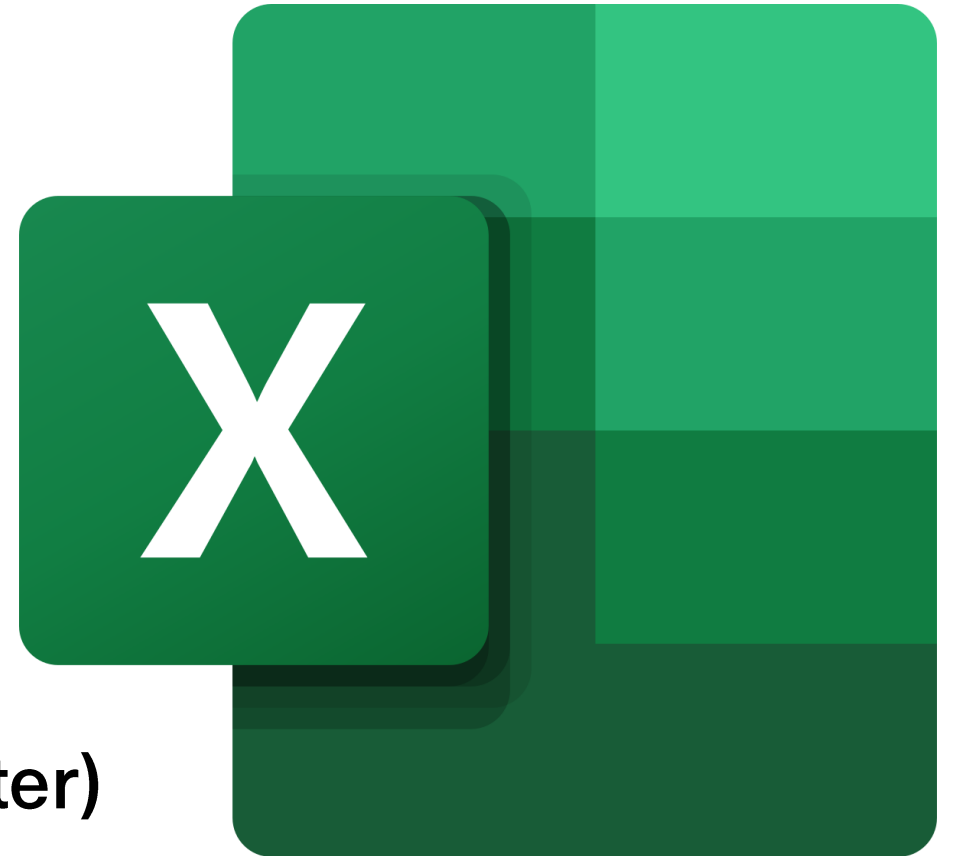
Other considerations

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

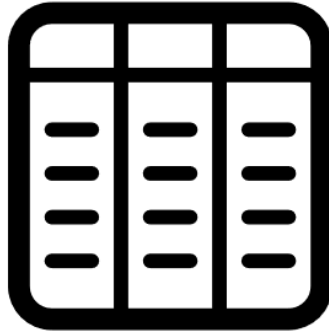
Why we chose Excel

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

(However, version control could be better)



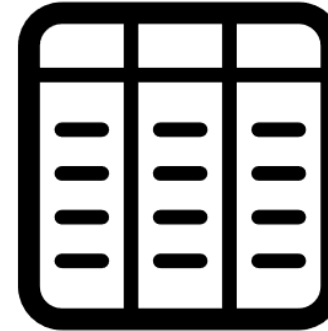
Patient



—	—	—
—	—	—
—	—	—
—	—	—

PatientID
Country
Birthdate
Sex
DeathDate
MigDate

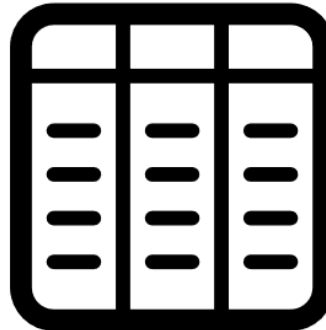
Diagnosis



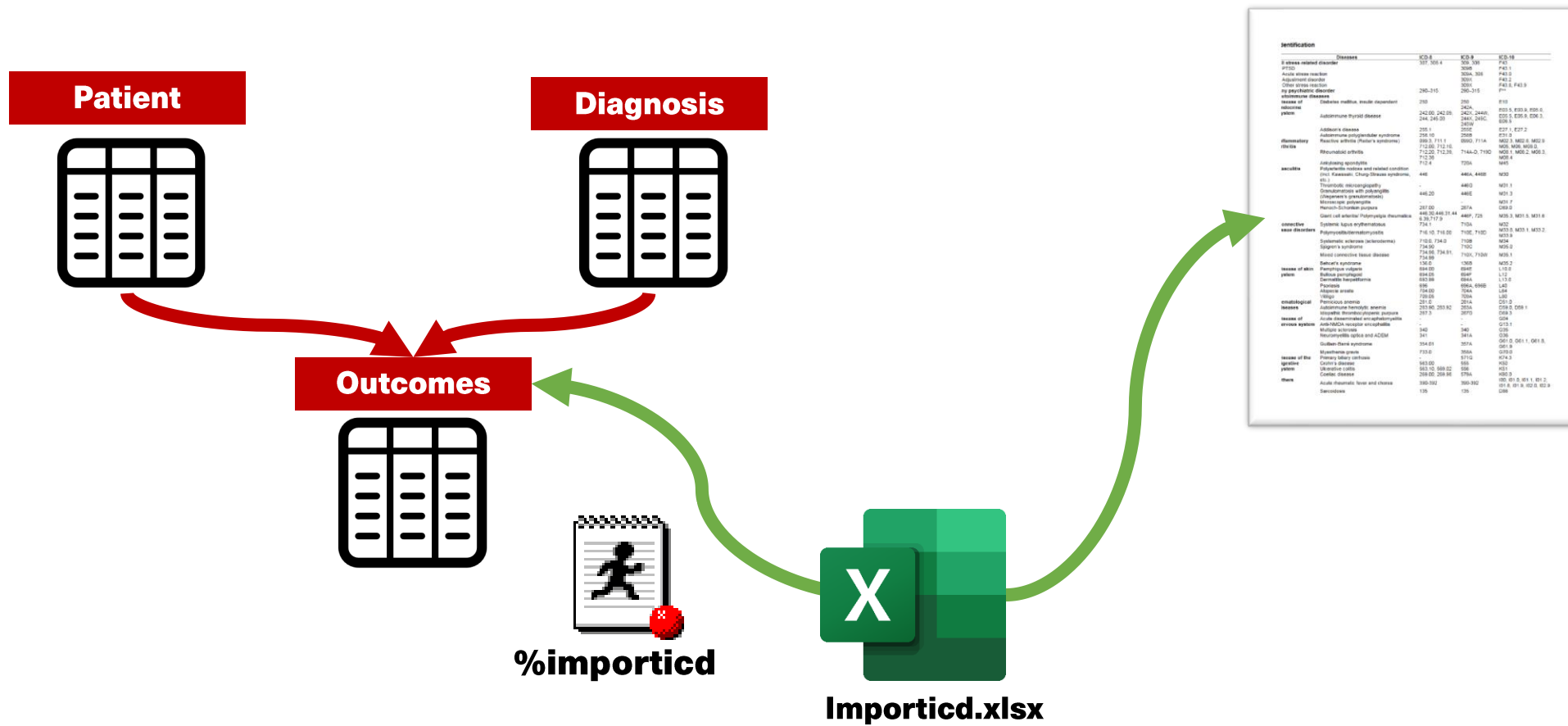
—	—	—
—	—	—
—	—	—
—	—	—

PatientID
Diagnosis
ICD_version
Country
DiagnosisDate

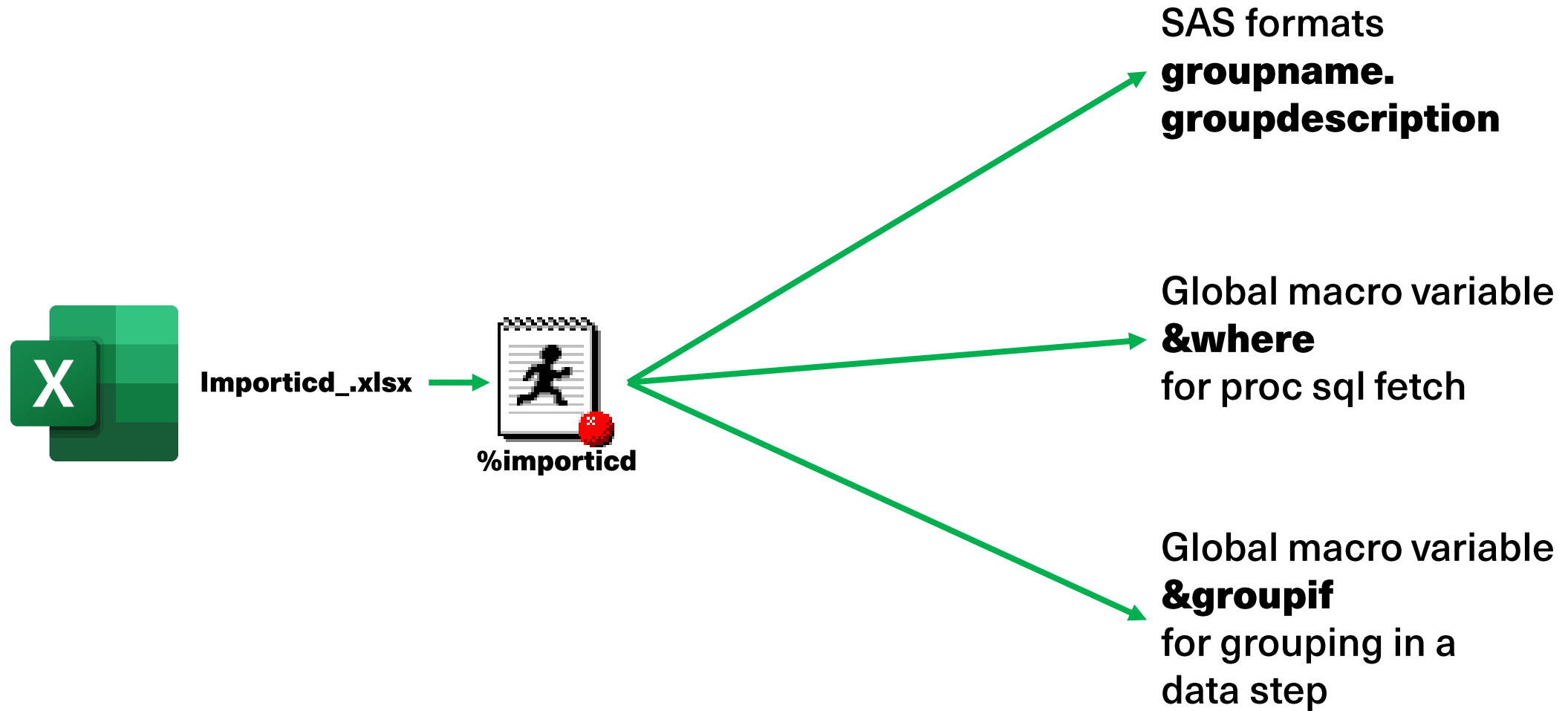
Outcomes



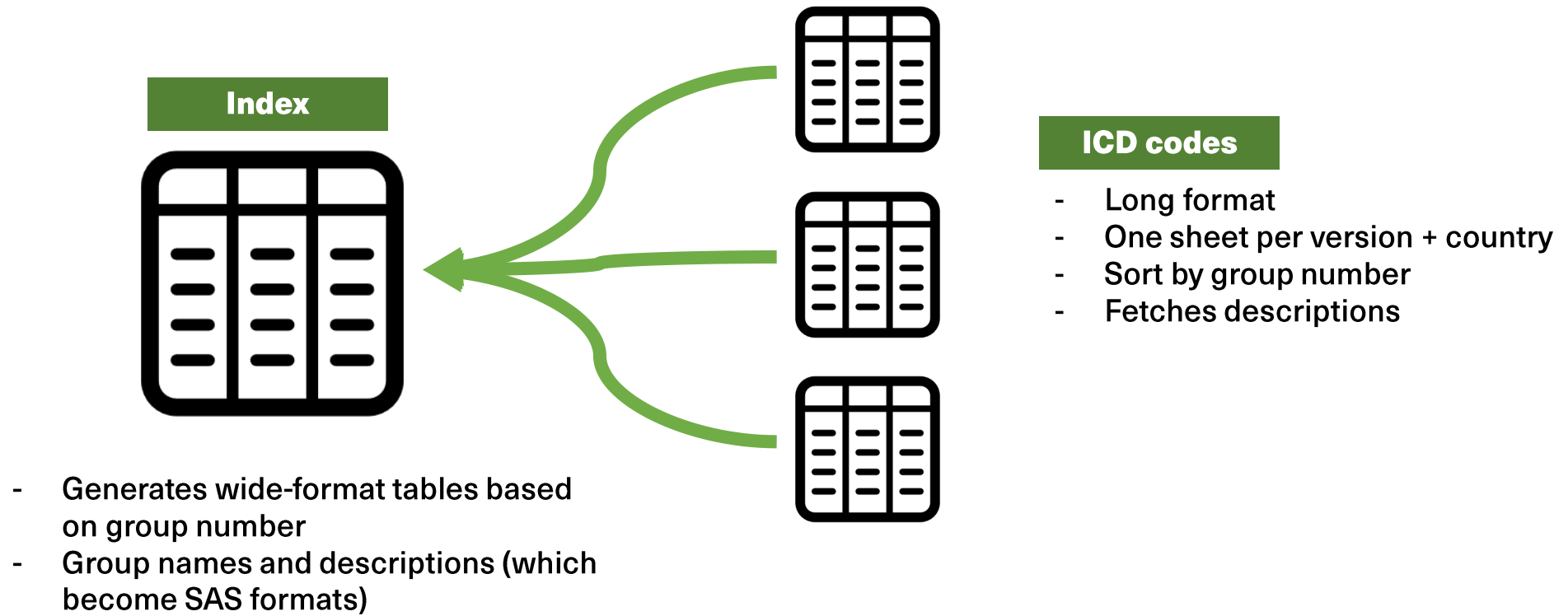
—	—	—
—	—	—
—	—	—
—	—	—



Overview of imported



Overview of importcd.xlsx

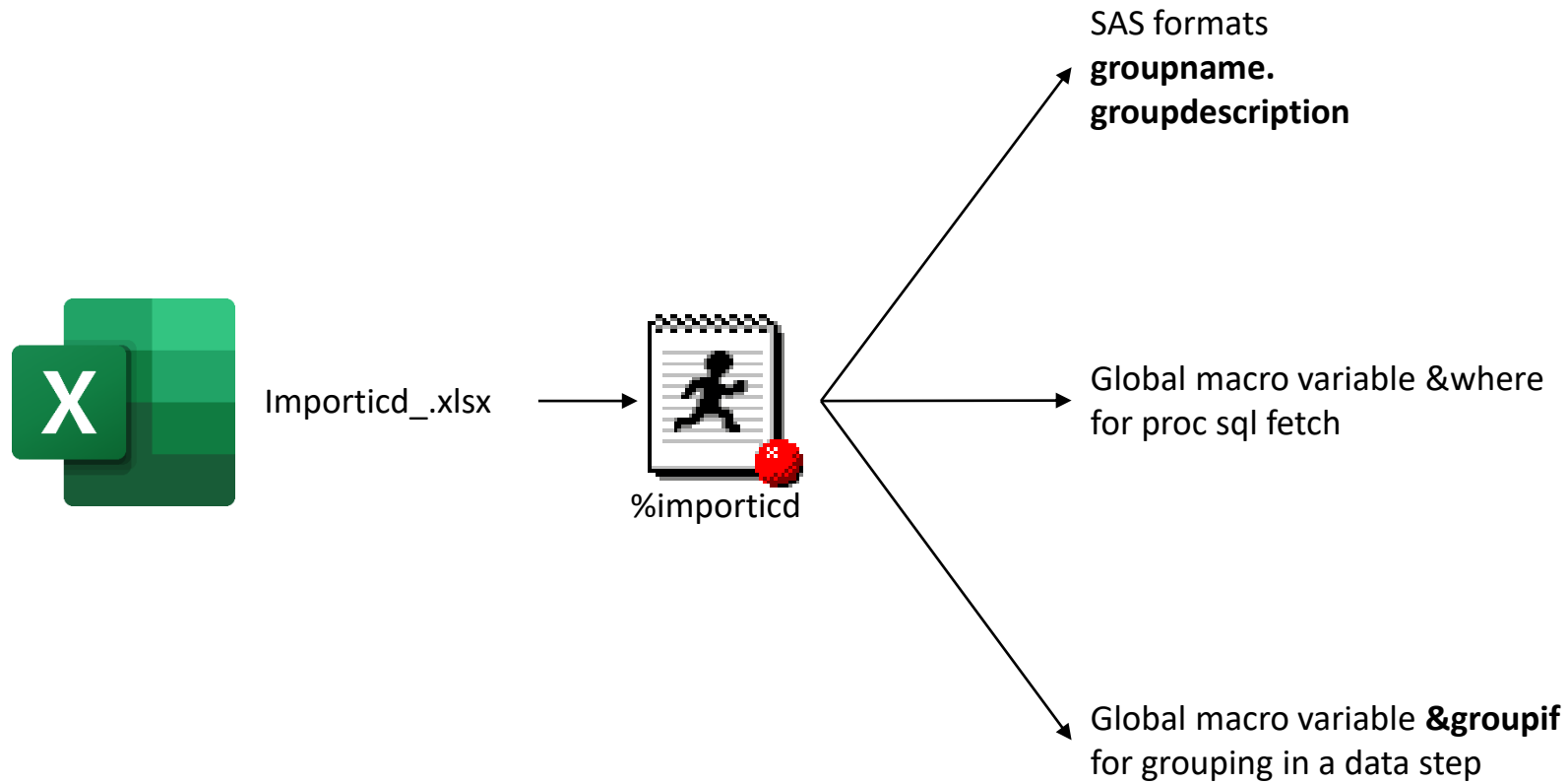


www.github.com/scandat/importcd

Demo

extra slides

Overview of importcd



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

%importcd

The SAS macro %importcd and the excel sheet importcd_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

```
%importcd("...\importcd_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;
```