REDISTRIBUTION OF ILL-DEFINED DEATHS
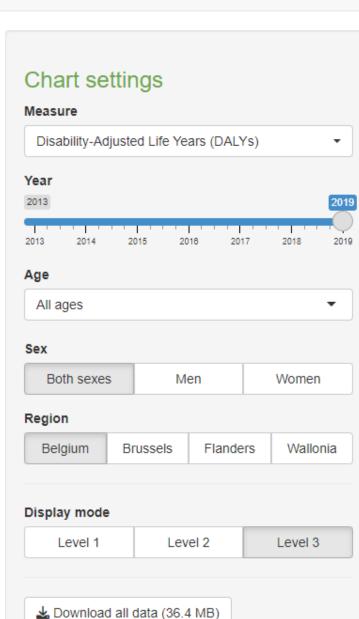
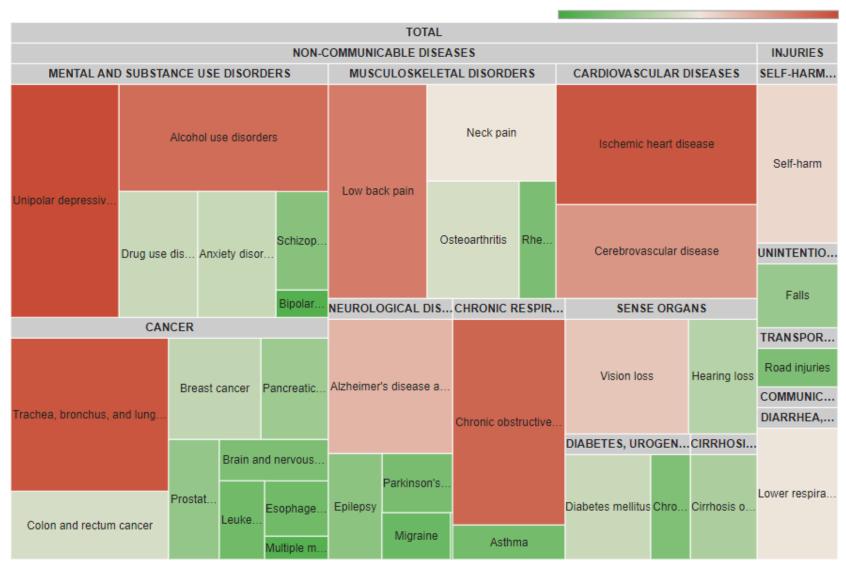## BELGIAN NATIONAL BURDEN OF DISEASE STUDY

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https://burden.sciensano.be/shiny/daly/

REDISTRIBUTION METHODOLOGY

Death certificate

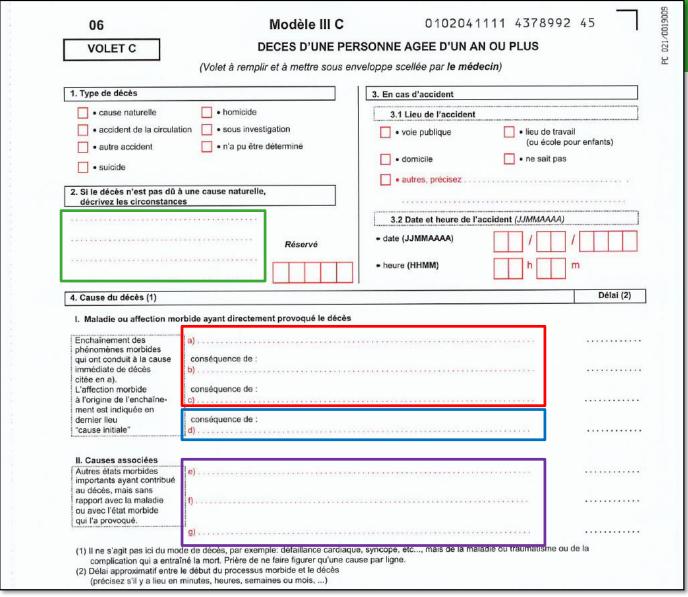External cause of death

Immediate cause of death
Intermediate causes of death

Underlying cause of death

Associated causes of death

Redistribution

- Four steps
  1. Predefined ICD codes
  2. ICD packages based on MCOD
  3. Internal redistribution
  4. All causes

- "Target" gets updated at each step

- Probabilistic process → 100 complete datasets generated
  - Quantification of uncertainty

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Master file for redistribution

	A	B	C	D	E	F	G	H
1	ICD_CODE	N17	N1317	ICD_LAB	REDISTRIBUTION	TARGET	PKG	PKG_NAME
2	I509	3924	19082	Heart failure, unspecified	PKG		33	Heart failure unspecified right or lef
3	I64	3091	16429	Stroke, not specified as haemorrhage or in	ICD	I60:I61 | I620 | I63		
4	J189	3280	14123	Pneumonia, unspecified organism	Level3	lri		
5	R99	1954	9811	Ill-defined and unknown cause of mortalit	Level0	ALL		
6	R54	1820	7788	Age-related physical debility	Level0	ALL		
7	R092	1230	5999	Respiratory arrest	Level0	ALL		
8	I469	1195	5520	Cardiac arrest, cause unspecified	Level0	ALL		
9	I519	794	5005	Heart disease, unspecified	ICD	I01:I02 | I05:I09 | I11 | I20:I25 | I28 | I30:I31 | I33:I40 | I42 | I47:I4		
10	I501	910	4924	Left ventricular failure	PKG		34	Left heart failure
11	C800	930	4504	Disseminated malignant neoplasm, unspe	Level2	neo		
12	A419	616	4448	Sepsis, unspecified organism	PKG		1	Sepsis
13	J690	935	3685	Pneumonitis due to inhalation of food and	PKG		16	Pneumonitis
14	J180	748	3519	Bronchopneumonia, unspecified organism	Level3	lri		
15	I499	645	3360	Cardiac arrhythmia, unspecified	PKG		18	Cardiac rhythm disorders
16	I269	608	3325	Pulmonary embolism without acute cor pu	PKG		20	Pulmonary embolism
17	N19	576	3158	Unspecified kidney failure	PKG		3	Acute kidney failure
18	X590	291	2362	Exposure to unspecified factor causing fra	ICD	V01:V99 | W00:W99 | X00:X58		
19	B99	516	2343	Other and unspecified infectious diseases	ICD	A00:A99 | B00:B93		
20	J22	457	2138	Unspecified acute lower respiratory infecti	Level3	lri		
21	K922	465	2102	Gastrointestinal hemorrhage, unspecified	PKG		26	Gastrointestinal bleeding
22	R53	455	2049	Malaise and fatigue	Level0	ALL		
23	I500	265	1733	Congestive heart failure	PKG		33	Heart failure unspecified right or lef
24	V892	291	1726	Person injured in unspecified motor-vehicl	ICD	V01:V06 | V09:V86 | V872:V878 | V88 | V880:V889		
25	X599	567	1696	Exposure to unspecified factor causing oth	ICD	V01:V99 | W00:W99 | X00:X58		
26	I10	322	1650	Essential (primary) hypertension	PKG		19	Hypertension
27	E86	335	1536	Volume depletion	Level0	ALL		
28	C260	293	1466	Malignant neoplasm of intestinal tract, pa	ICD	C15:C25		

(1) Predefined ICD codes

Non-specific code	ICD name	Target codes
I64	Stroke, not specified as haemorrhage or infarction	I60:I61 | I620 | I63
J18.9	Pneumonia, unspecified organism	lri
J18.0	Bronchopneumonia, unspecified organism	lri
C55	Malignant neoplasm of uterus, part unspecified	C53:C54
C80.0	Disseminated malignant neoplasm, unspecified	neo

(1) Predefined ICD codes

1. Define target codes (cf previous slide)

2. Select all specific deaths with target code in past 5 years

3. Stratify by age group and sex

4. Randomly select one code within (age/sex specific) target

   → corresponds to proportional (pro rata) distribution

(2) ICD packages

- Some ICD codes do not have an explicit link with other codes

- We use the multiple cause of death data to define "packages"

- A package is a subset of specific and redistributed deaths, in past 5 years, where the non-specific codes were present as immediate, intermediate, associated or external cause

- As before, redistribution based on random sampling within package, by age group and sex

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(2) ICD packages

Non-specific code	ICD name	Package
I50.0	Congestive heart failure	Heart failure unspecified right or left
I50.9	Heart failure, unspecified	
I50.1	Left ventricular failure	Left heart failure
I27.0	Primary pulmonary hypertension	Right heart failure and pulmonary heart disease
I27.2	Other secondary pulmonary hypertension	
I27.8	Other specified pulmonary heart diseases	
I27.9	Pulmonary heart disease, unspecified	
I28.9	Disease of pulmonary vessels, unspecified	

(2) ICD packages

2. Si le décès n'est pas dû à une cause naturelle, décrivez les circonstances

....

....

....

Réservé

Non-specific code in external, immediate, intermediate, associated?

4. Cause du décès (1)	Délai (2)

I. Maladie ou affection morbide ayant directement provoqué le décès

Enchaînement des phénomènes morbides qui ont conduit à la cause immédiate de décès citée en a).
L'affection morbide à l'origine de l'enchaînement est indiquée en dernier lieu "cause initiale"

a) ....

conséquence de :

b) ....

conséquence de :

c) ....

conséquence de :

d) ....

Specific code

II. Causes associées

Autres états morbides importants ayant contribué au décès, mais sans rapport avec la maladie ou avec l'état morbide qui l'a provoqué.

e) ....

f) ....

g) ....

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(2) ICD packages

Target distribution
(stratified by age and sex)

(3) Internal redistribution

2. Si le décès n'est pas dû à une cause naturelle, décrivez les circonstances

....

....

....

Réservé

Any specific codes in external, immediate, intermediate, associated?

4. Cause du décès (1) | Délai (2)

I. Maladie ou affection morbide ayant directement provoqué le décès

Enchaînement des phénomènes morbides qui ont conduit à la cause immédiate de décès citée en a). L'affection morbide à l'origine de l'enchaînement est indiquée en dernier lieu "cause initiale"

a) ....

consequence de :

b) ....

consequence de :

c) ....

consequence de :

d) .... **Non-specific code**

II. Causes associées

Autres états morbides importants ayant contribué au décès, mais sans rapport avec la maladie ou avec l'état morbide qui l'a provoqué.

e) ....

f) ....

g) ....
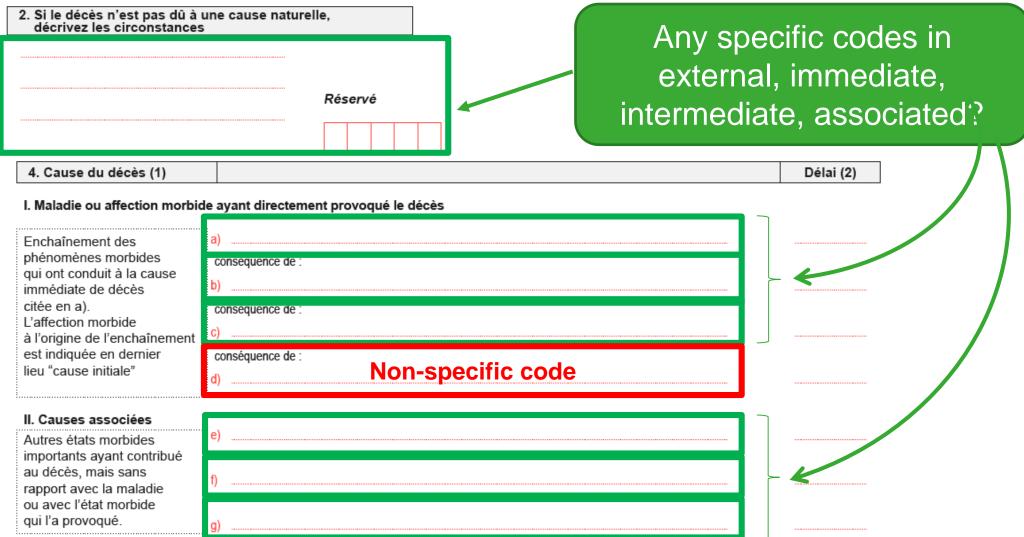
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(4) All causes

- Final step in the process, applied to all deaths that had not yet been redistributed
- Randomly selected on specific code across all specific or redistributed deaths, by age group and sex

R54	Age-related physical debility
R99	Ill-defined and unknown cause of mortality
R09.2	Respiratory arrest
I46.9	Cardiac arrest, cause unspecified

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Some details..

- Causes with less than 5 occurrences are not considered as target (e.g., rabies)
- Algorithm makes sure that sex-specific causes are not redistributed to other sex (e.g., prostate cancer in women)
- If age/sex specific target does not have enough deaths, then all-age target was considered; if still not sufficient, then redistribute to complete target
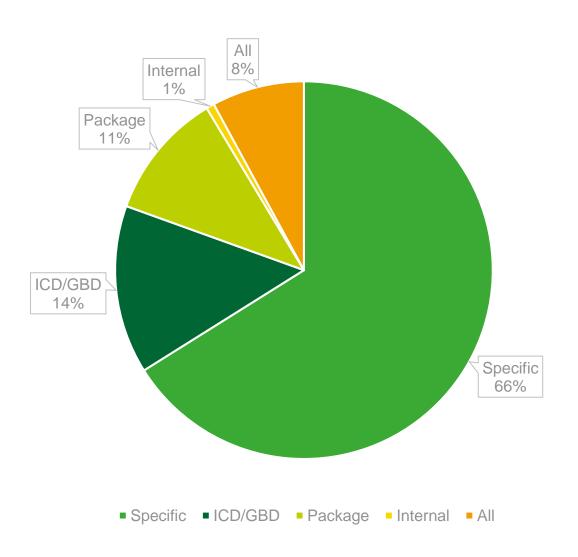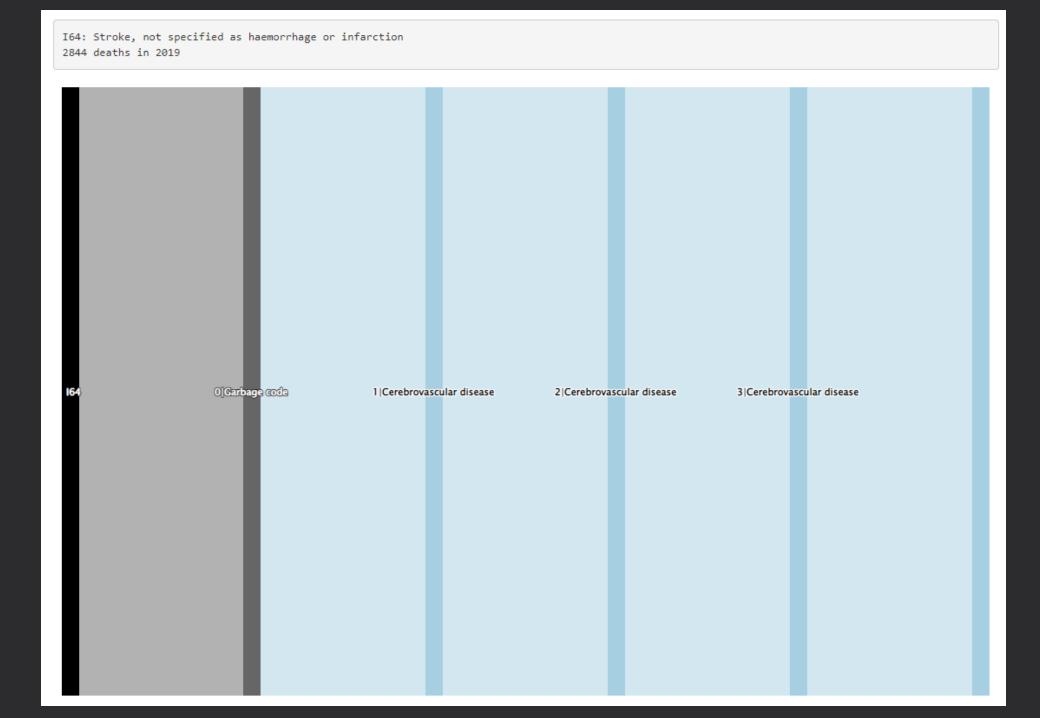- If target empty, then redistribute to all causes

REDISTRIBUTION RESULTS

Redistribution steps

Specific 66%
ICD/GBD 14%
Package 11%
Internal 1%
All 8%

■ Specific ■ ICD/GBD ■ Package ■ Internal ■ All

I64: Stroke, not specified as haemorrhage or infarction
2844 deaths in 2019

I64 | 0|Garbage code | 1|Cerebrovascular disease | 2|Cerebrovascular disease | 3|Cerebrovascular disease

I509: Heart failure, unspecified
4102 deaths in 2019

I509 · 0|Garbage code · 1|Garbage code

2|Other causes · 3|Other causes · 4|Other causes

2|Ischemic heart disease · 3|Ischemic heart disease · 4|Ischemic heart disease

2|Other cardiovascular and circulatory diseases · 4|Other cardiovascular and circulatory diseases

2|Lower respiratory infections · 3|Lower respiratory infections

2|Atrial fibrillation and flutter · 3|Atrial fibrillation and flutter

2|Chronic obstructive pulmonary disease · 4|Chronic obstructive pulmonary disease

2|Alzheimer's disease and other dementias · 4|Alzheimer's disease and other dementias

2|Cerebrovascular disease · 3|Cerebrovascular disease

2|Chronic kidney diseases · 3|Chronic kidney diseases

2|Cardiomyopathy and myocarditis · 3|Cardiomyopathy and myocarditis

R99: Ill-defined and unknown cause of mortality
3204 deaths in 2019

R99 — 0|Garbage code — 1|Garbage code — 2|Garbage code — 3|Garbage code — 4|Other causes

3|Garbage code

4|Ischemic heart disease

4|Trachea, bronchus, and lung cancers

4|Alzheimer's disease and other dementias

4|Cerebrovascular disease

4|Lower respiratory infections

4|Chronic obstructive pulmonary disease

4|Colon and rectum cancer

3|Other causes

4|Self-harm

4|Other cardiovascular and circulatory diseases

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Explore BeBOD online

https://burden.sciensano.be/shiny/mortality
https://www.healthybelgium.be/en/health-status/burden-of-disease
https://www.sciensano.be/en/projects/belgian-national-burden-disease-study

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