Forecasting Deaths from a Single Cause with Competing Risks

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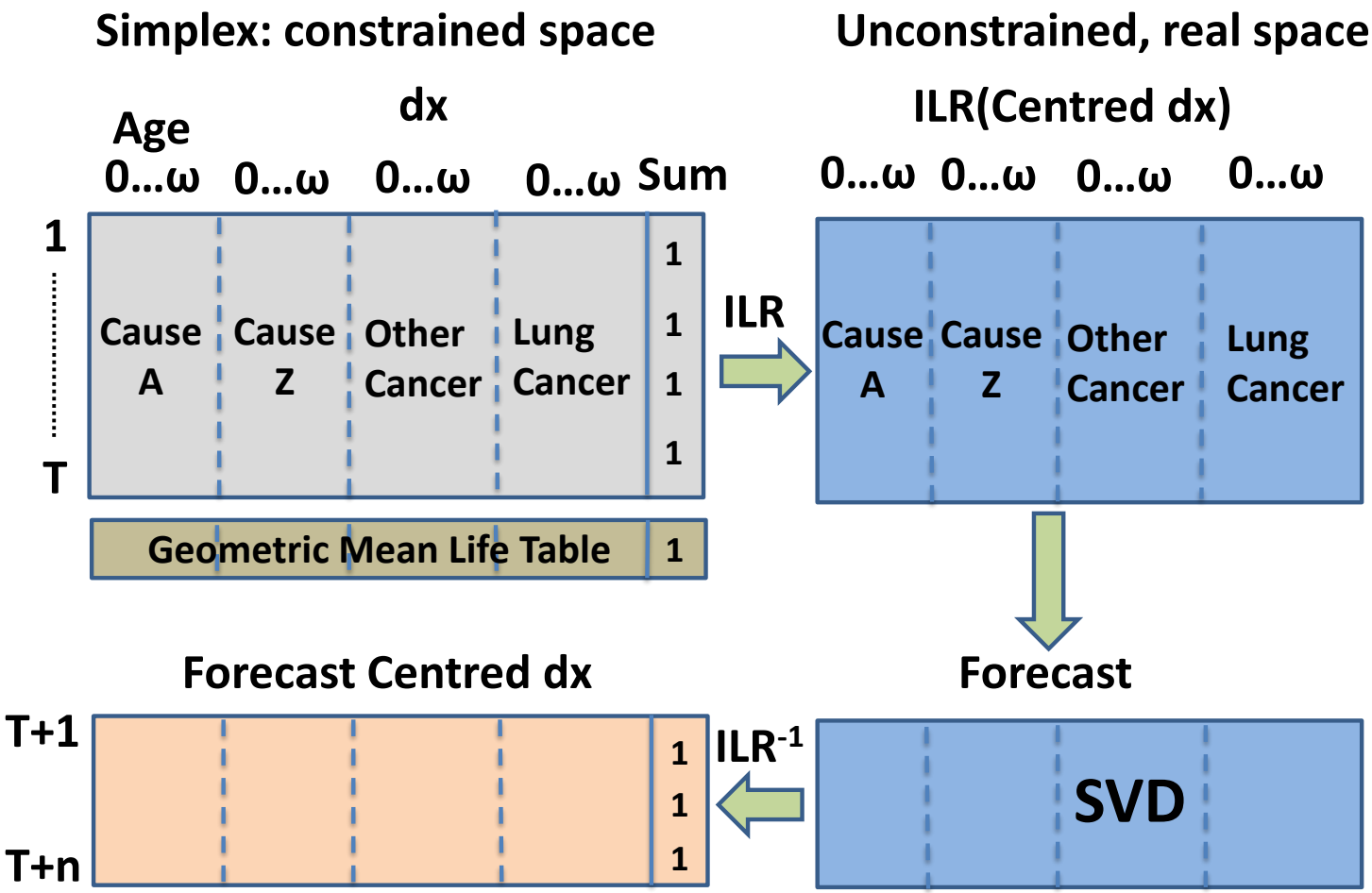
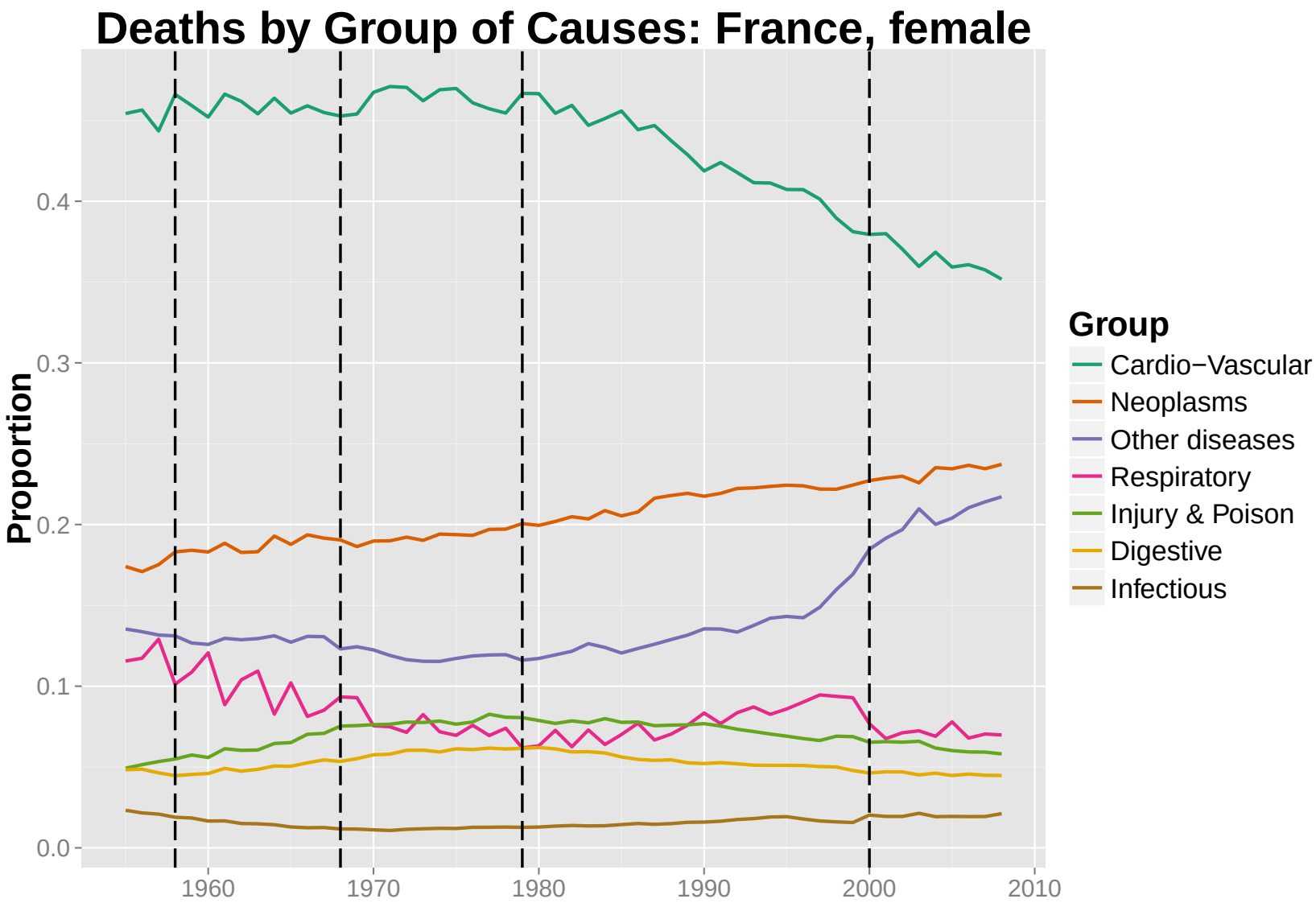
Outline

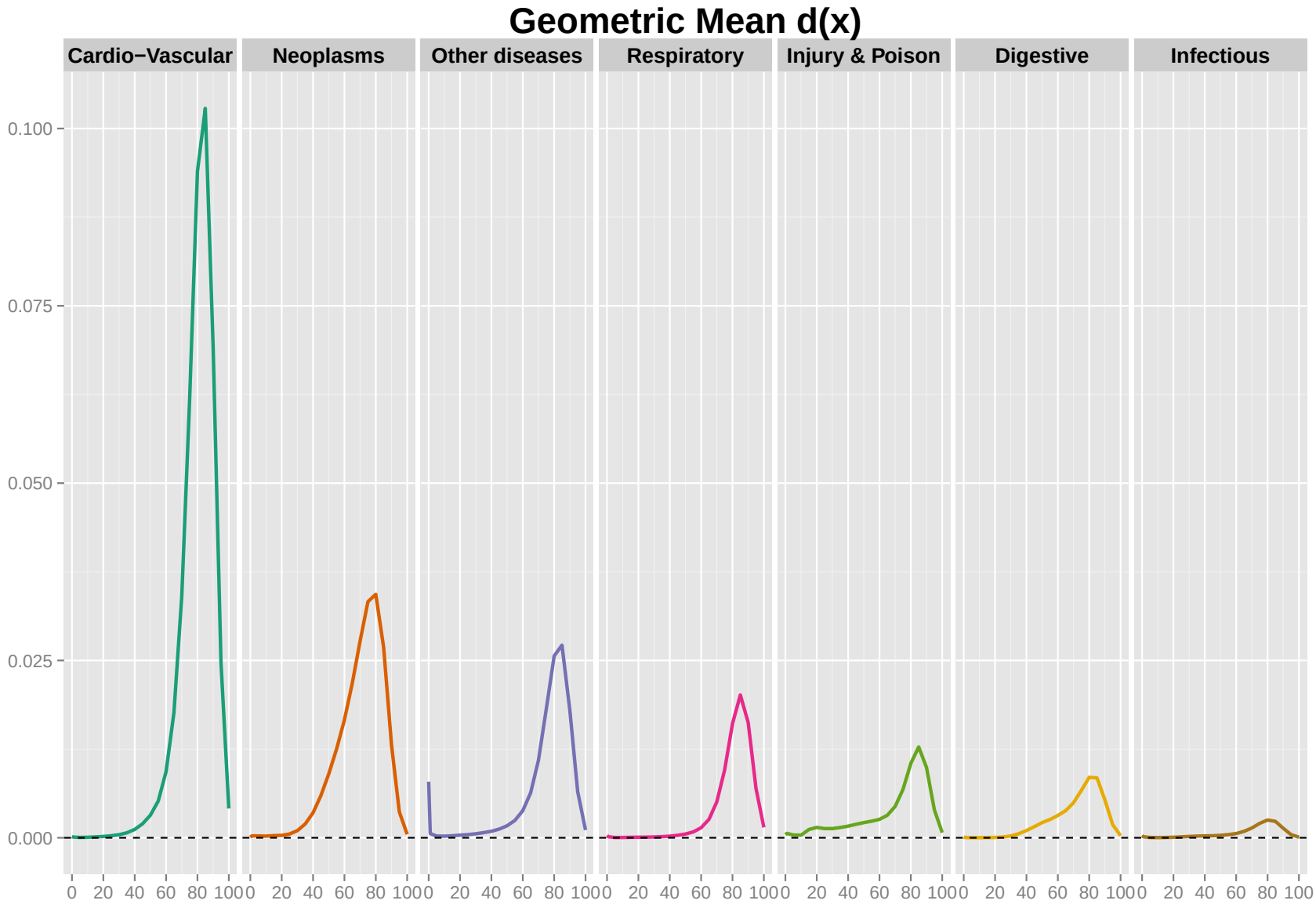
Outline

One Cause of Death and Competing Risks



Outline

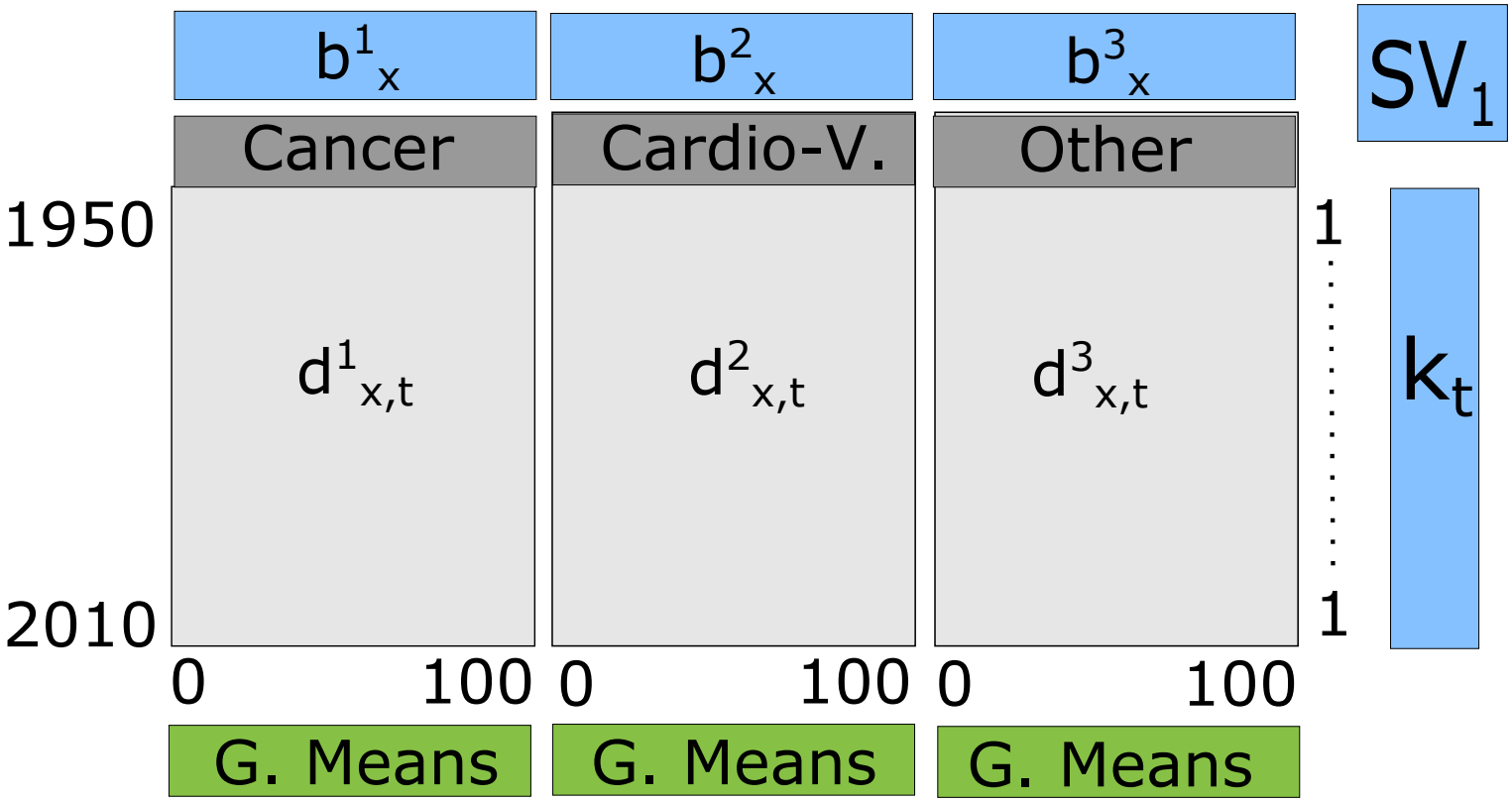

Deaths by Group of Causes: France, female
Proportion
0.0
0.1
0.2
0.3
0.4
1960
1970
1980
1990
2000
2010
Group
Cardio−Vascular
Neoplasms
Other diseases
Respiratory
Injury & Poison
Digestive
Infectious

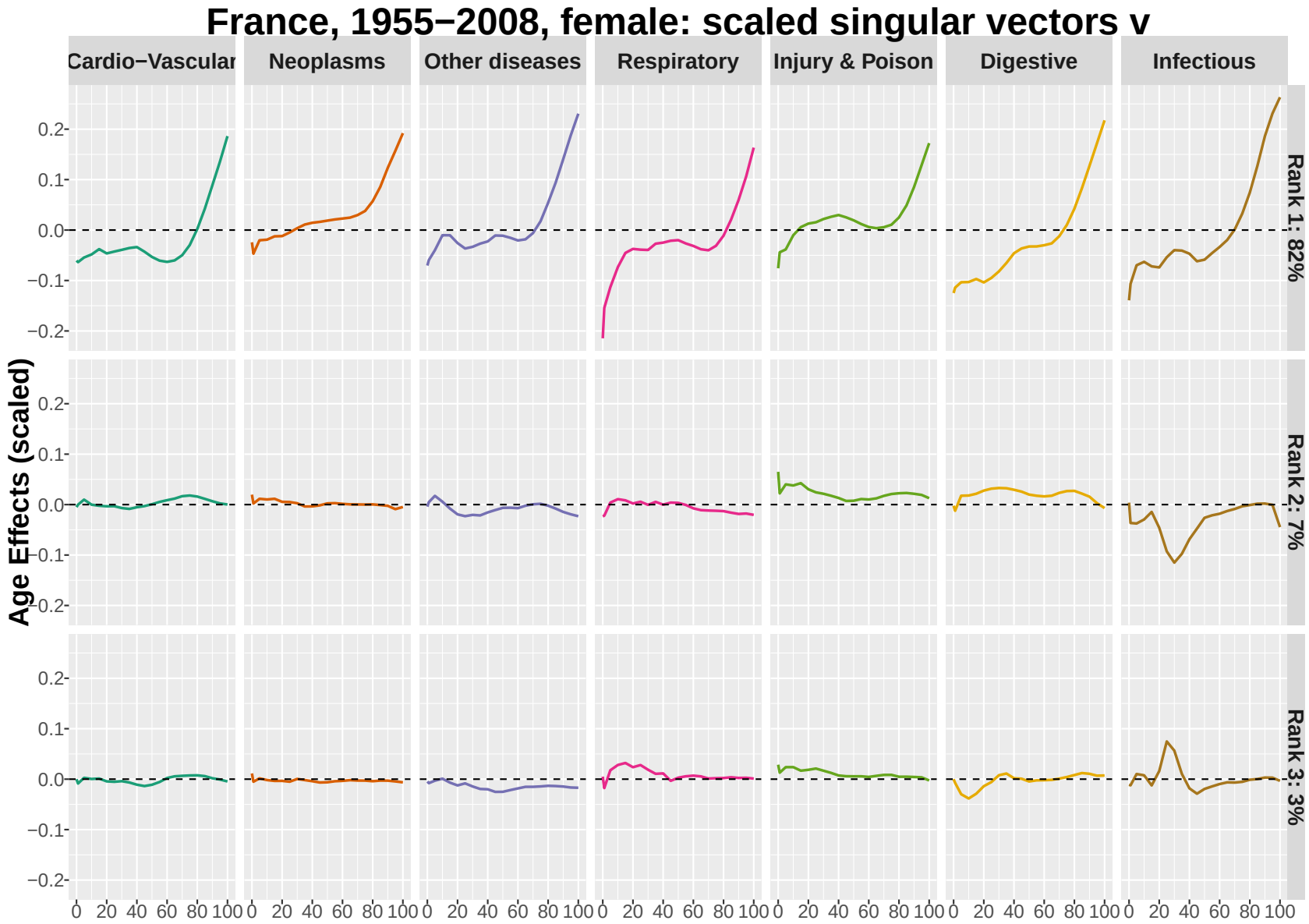

Geometric Mean d(x)
Cardio−Vascular
Neoplasms
Other diseases
Respiratory
Injury & Poison
Digestive
Infectious
0.100
0.075
0.050
0.025
0.000
0 20 40 60 80 100
0 20 40 60 80 100
0 20 40 60 80 100
0 20 40 60 80 100
0 20 40 60 80 100
0 20 40 60 80 100
0 20 40 60 80 100

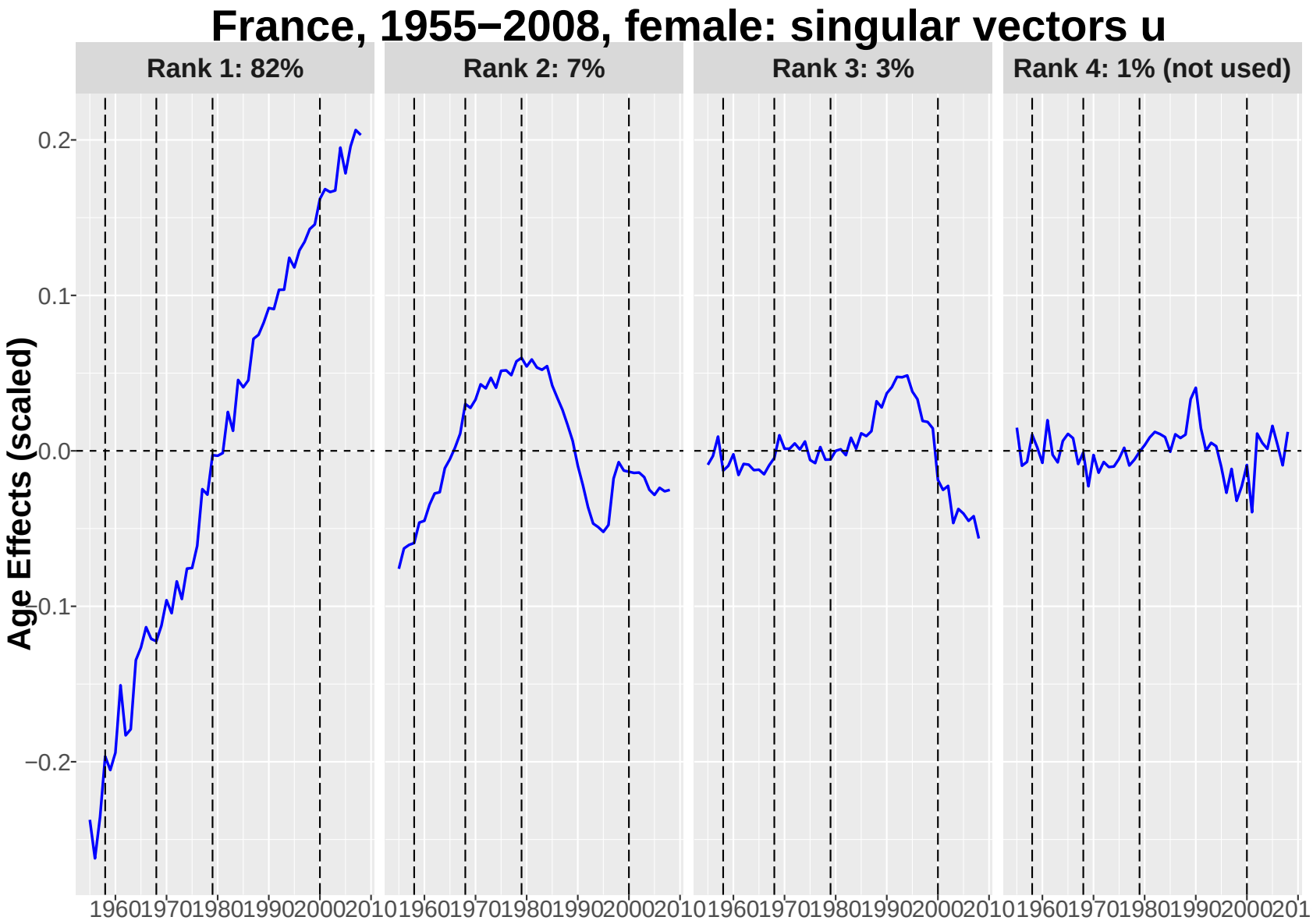
Outline

Outline

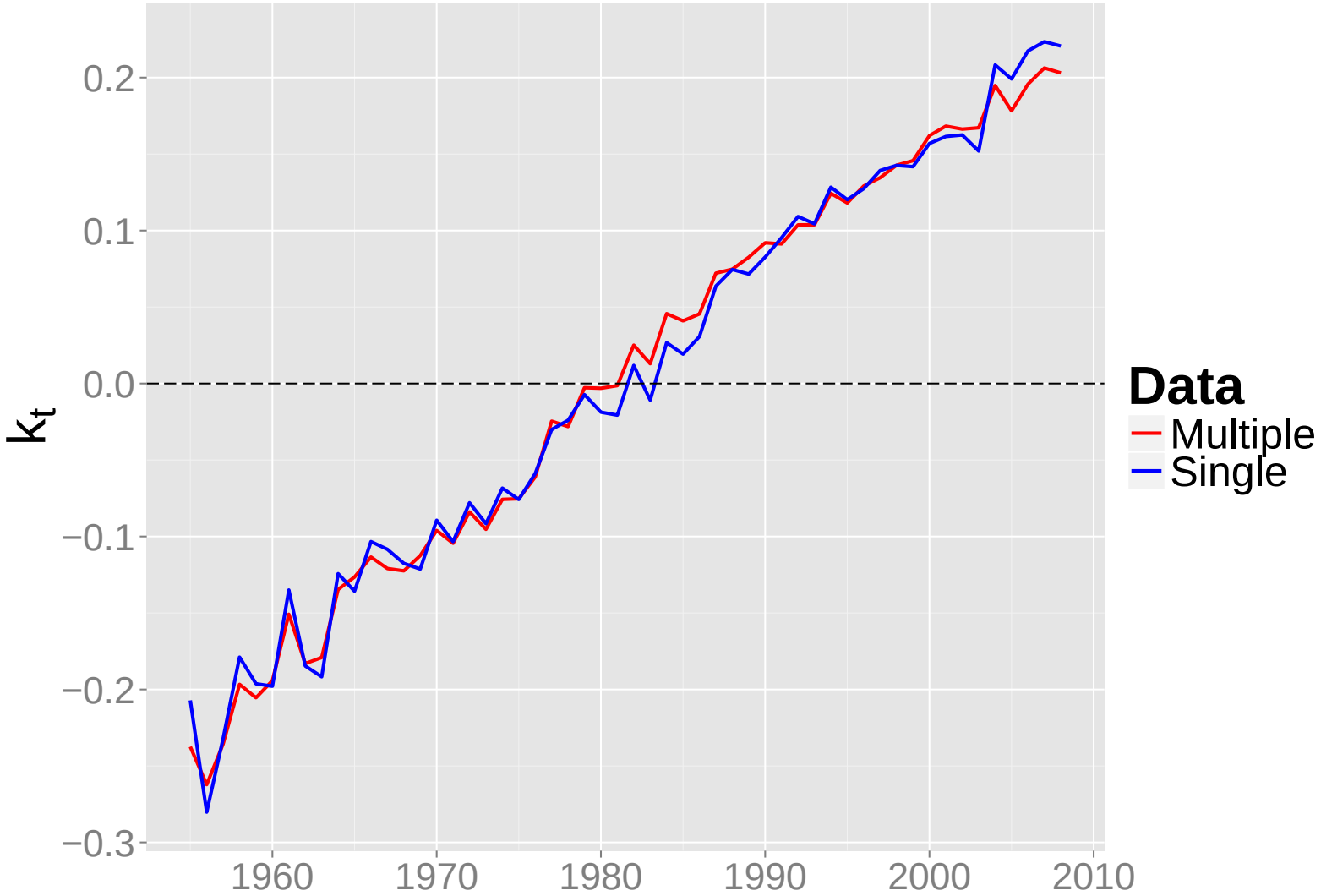
SVD: Multiple Causes of Death




France, 1955−2008, female: scaled singular vectors v
Cardio−Vascular
Neoplasms
Other diseases
Respiratory
Injury & Poison
Digestive
Infectious
Rank 1: 82%
Rank 2: 7%
Rank 3: 3%
Age Effects (scaled)
0.2
0.1
0.0
−0.1
−0.2
0 20 40 60 80 100


France, 1955–2008, female: singular vectors u
Rank 1: 82%
Rank 2: 7%
Rank 3: 3%
Rank 4: 1% (not used)
Age Effects (scaled)
0.2
0.1
0.0
−0.1
−0.2
1960 1970 1980 1990 2000 2010

SVD: Time Vectors



Outline

Kullback–Leibler Divergence

$$D_{KL}(P||Q) = \sum_i P_i \log \frac{P_i}{Q_i} \tag{1}$$

$$D_{KL}(P||Q) \geq 0 \tag{2}$$

$$D_{KL}({}_n d_x||\widehat{{}_n d_x}) = \sum_{x=0}^{\omega} {}_n d_x \log \frac{{}_n d_x}{\widehat{{}_n d_x}} \tag{3}$$

Outline

Each Disease versus the Remainder

Target & Size			Across All		Within Target	
Disease	Rank	Other	D_{KL}	Rank	D_{KL}	Rank
All	0		0.016			
C–V	1	Rem.	0.044	5	0.029	2
Neop.	2	Rem.	0.034	4	0.023	1
Other D	3	Rem.	0.031	2	0.061	3
I & P	4	Rem.	0.032	3	0.072	4
Resp.	5	Rem.	0.063	6	0.130	5
Digest.	6	Rem.	0.079	7	0.159	6
Inf.	7	Rem.	0.013	1	0.322	7

Neoplasms versus 1 Other and the Remainder

Target		Other		Across All		Within Target	
Disease	Rank	Disease	Rank	D_{KL}	Rank	D_{KL}	Rank
Neop.	2	Rem.	0	0.034		0.023	
Neop.	2	C–V	1	0.063	5	0.027	3
Neop.	2	Other D	3	0.047	1	0.024	1
Neop.	2	I & P	4	0.048	2	0.025	2
Neop.	2	Resp.	5	0.061	4	0.029	4
Neop.	2	Digest.	6	0.067	6	0.032	6
Neop.	2	Inf.	7	0.050	3	0.029	5

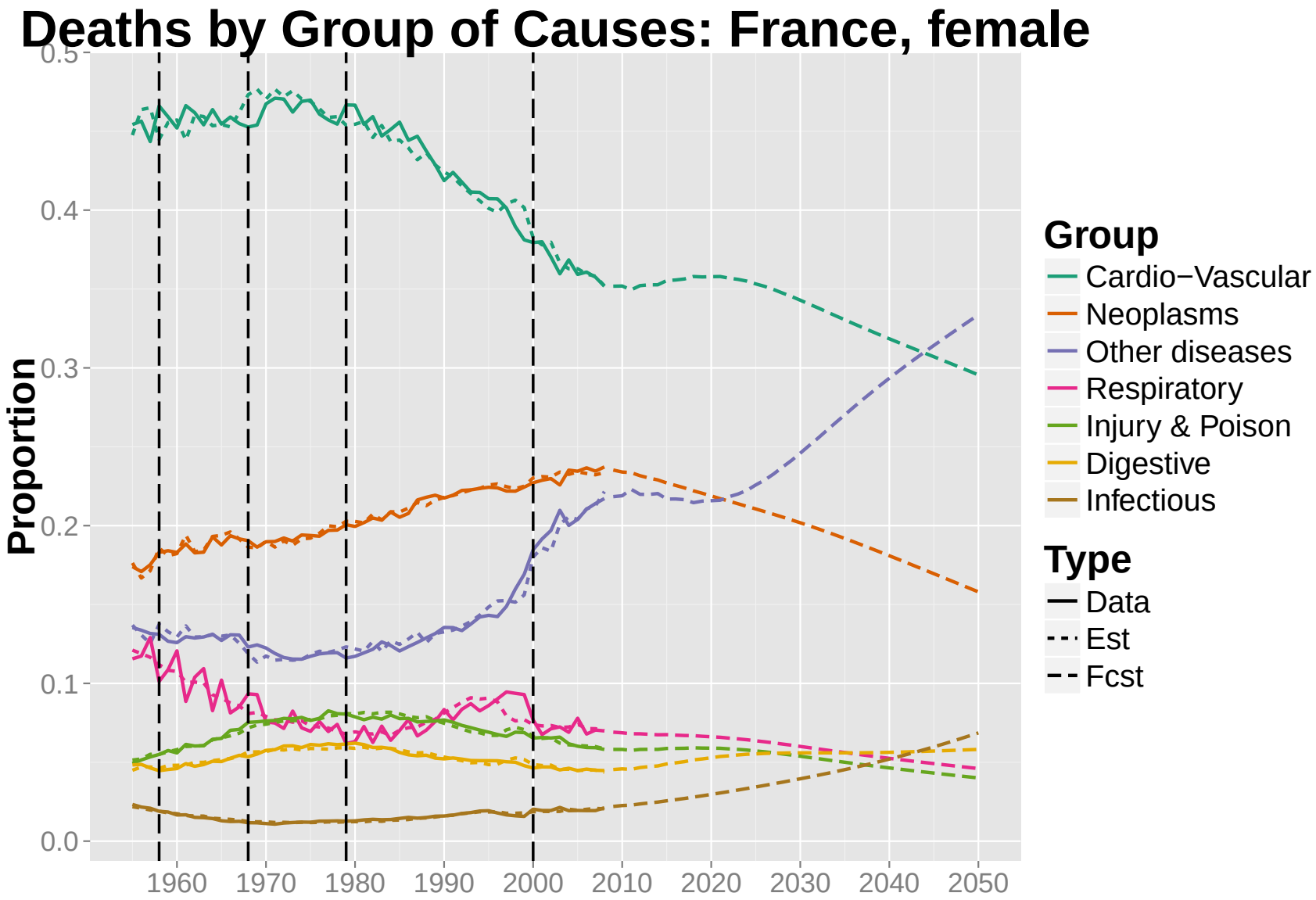
Best Model by Complexity Level

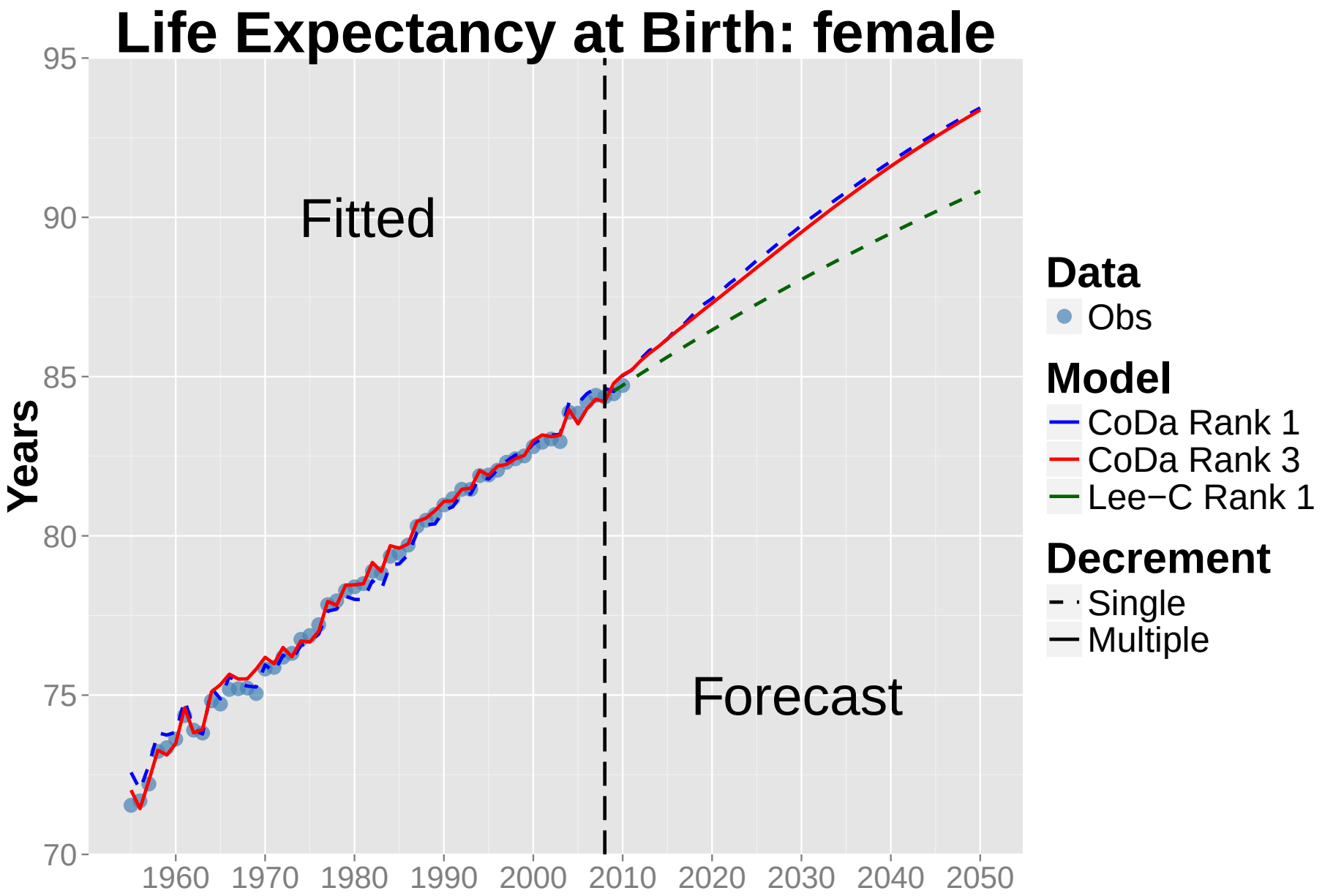
		D_{KL}	
Target	Competing Risks	Across	Within
Neoplasms	Remainder	0.034	0.023
Neoplasms	Other Dis., Remainder	0.047	0.024
Neoplasms	Other Dis., Inj. & Poison, Remainder	0.050	0.024

Best Model by Complexity Level

		D_{KL}	
Target	Competing Risks	Across	Within
Cardio–V.	Remainder	0.044	0.029
Cardio–V.	Other Dis., Remainder	0.059	0.029
Cardio–V.	Other Dis., Inj. & Poison, Remainder	0.054	0.028

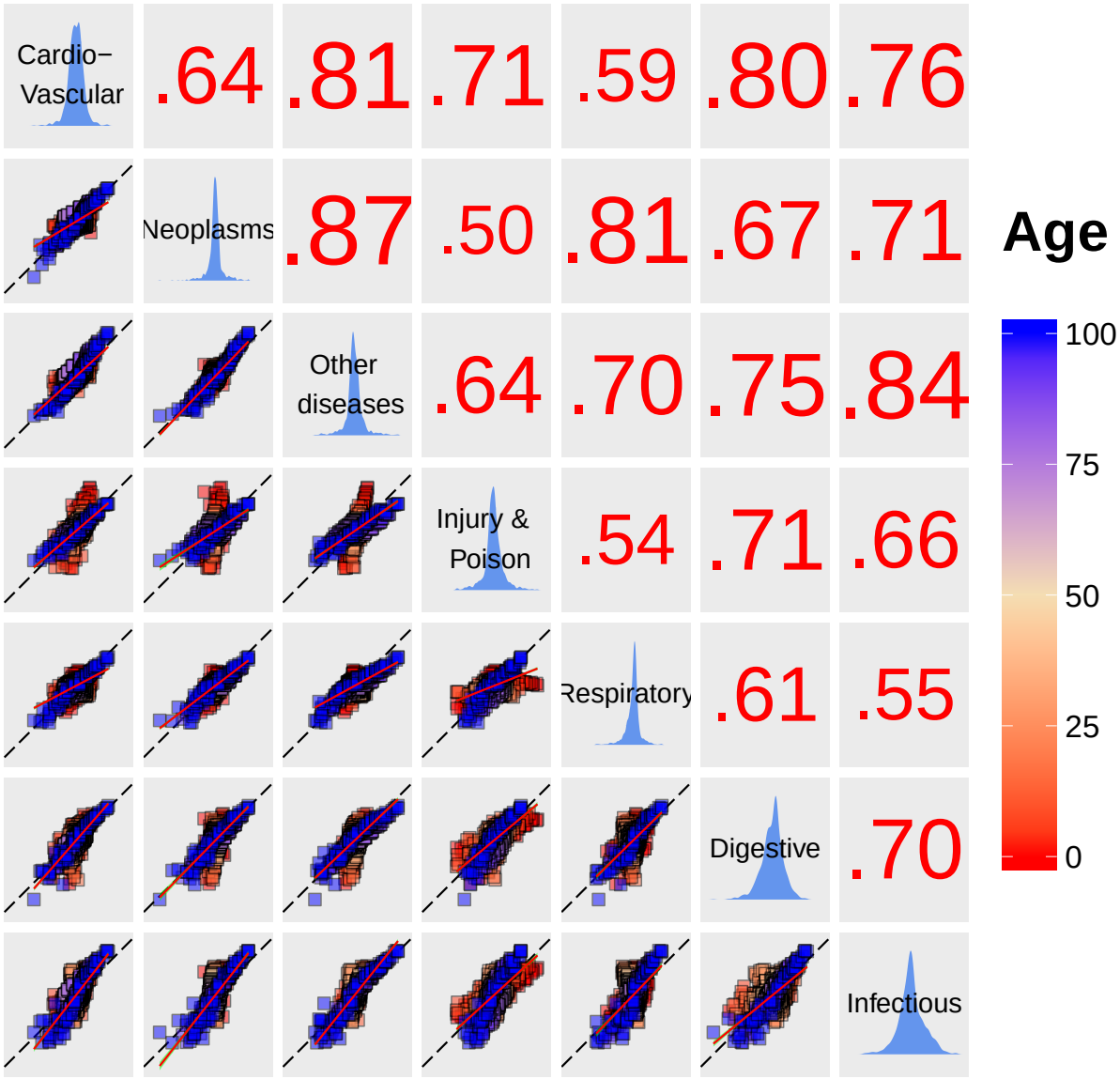
Outline


Deaths by Group of Causes: France, female
Proportion
0.5
0.4
0.3
0.2
0.1
0.0
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
Group
Cardio−Vascular
Neoplasms
Other diseases
Respiratory
Injury & Poison
Digestive
Infectious
Type
Data
Est
Fcst

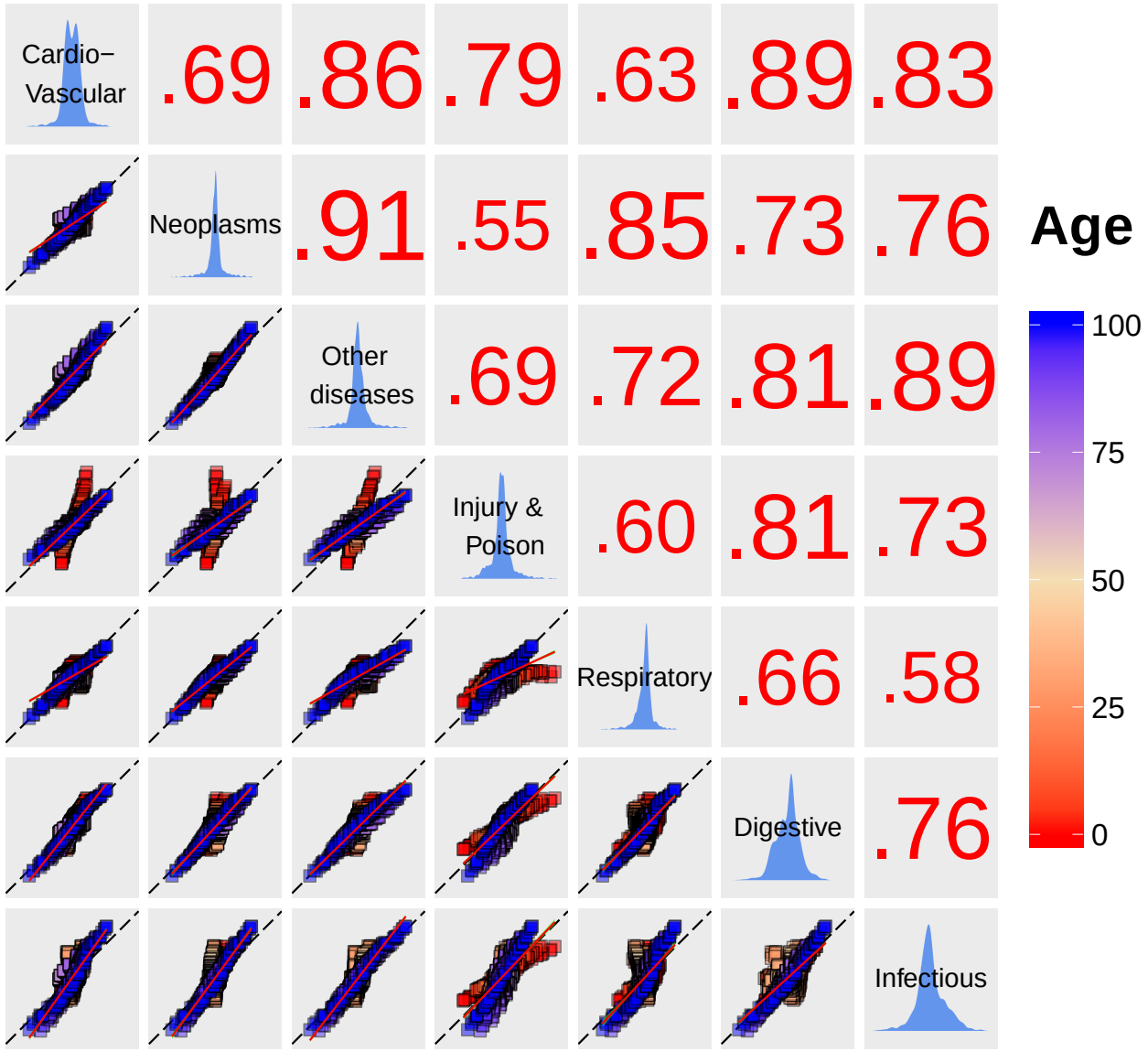

Life Expectancy at Birth: female
Years
95
90
85
80
75
70
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
Fitted
Forecast
Data
Obs
Model
CoDa Rank 1
CoDa Rank 3
Lee−C Rank 1
Decrement
Single
Multiple

Outline

Centred data: clr transform



Fitted Centred data: clr transform



Compositional residuals: clr transform