



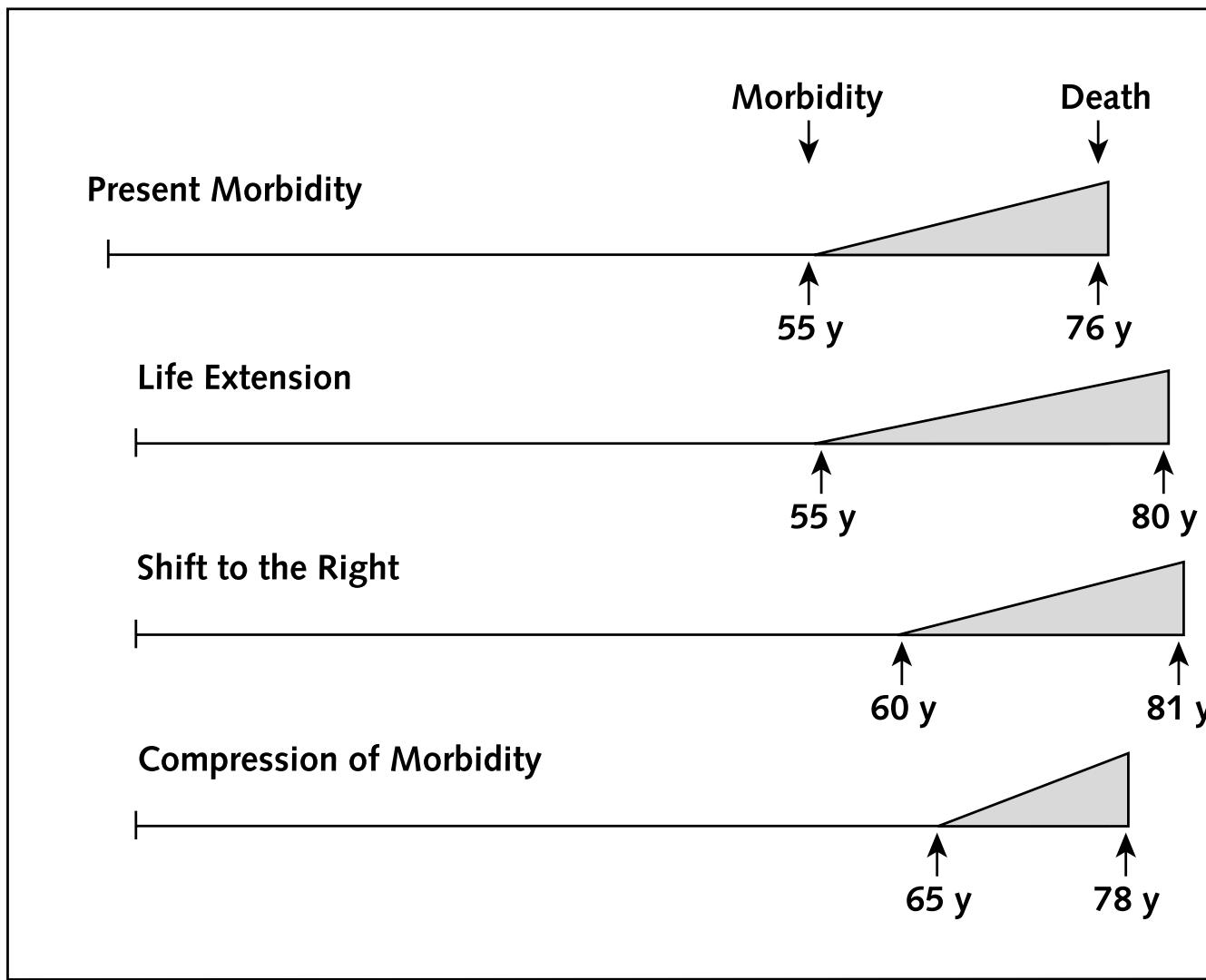
MAX PLANCK INSTITUTE
FOR DEMOGRAPHIC
RESEARCH

Morbidity Concentration and Dispersion

Tim Riffe, Aïda Solé Auro, Maarten J. Bijlsma

Fries' diagrams are a nice prop

Figure 1. Possible scenarios for future morbidity and longevity.



Patterns matter if lifespans are mixed



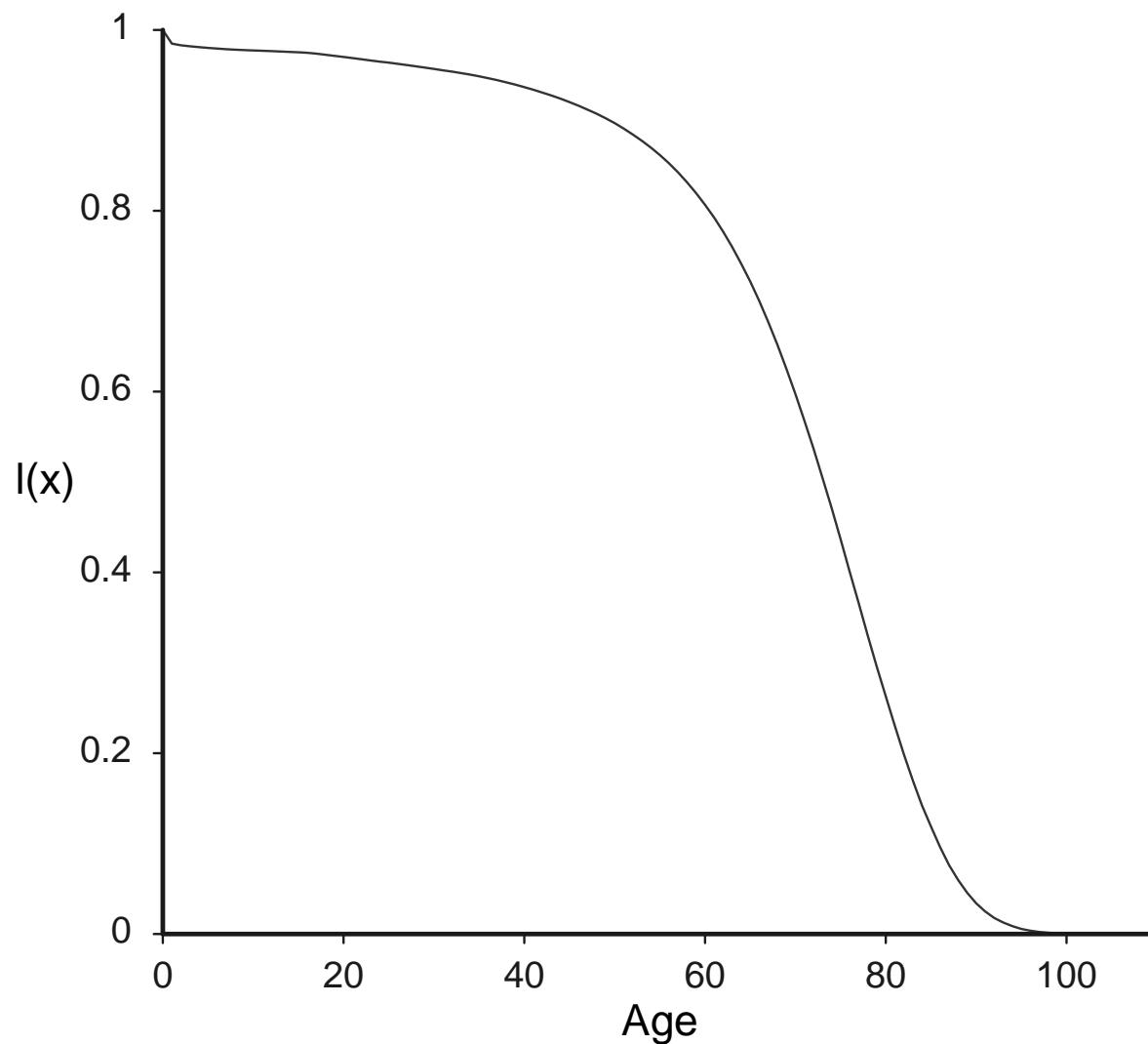
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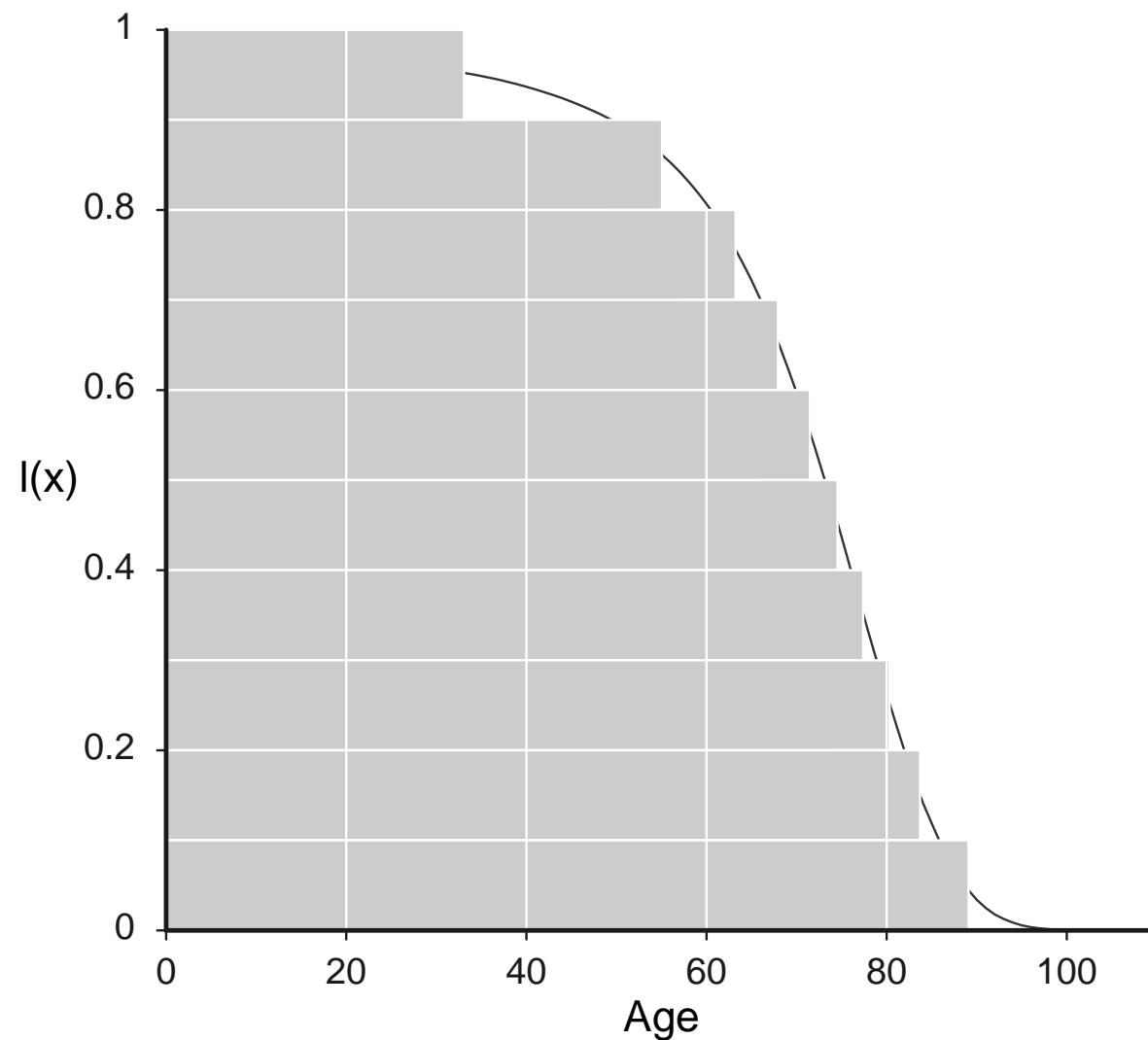
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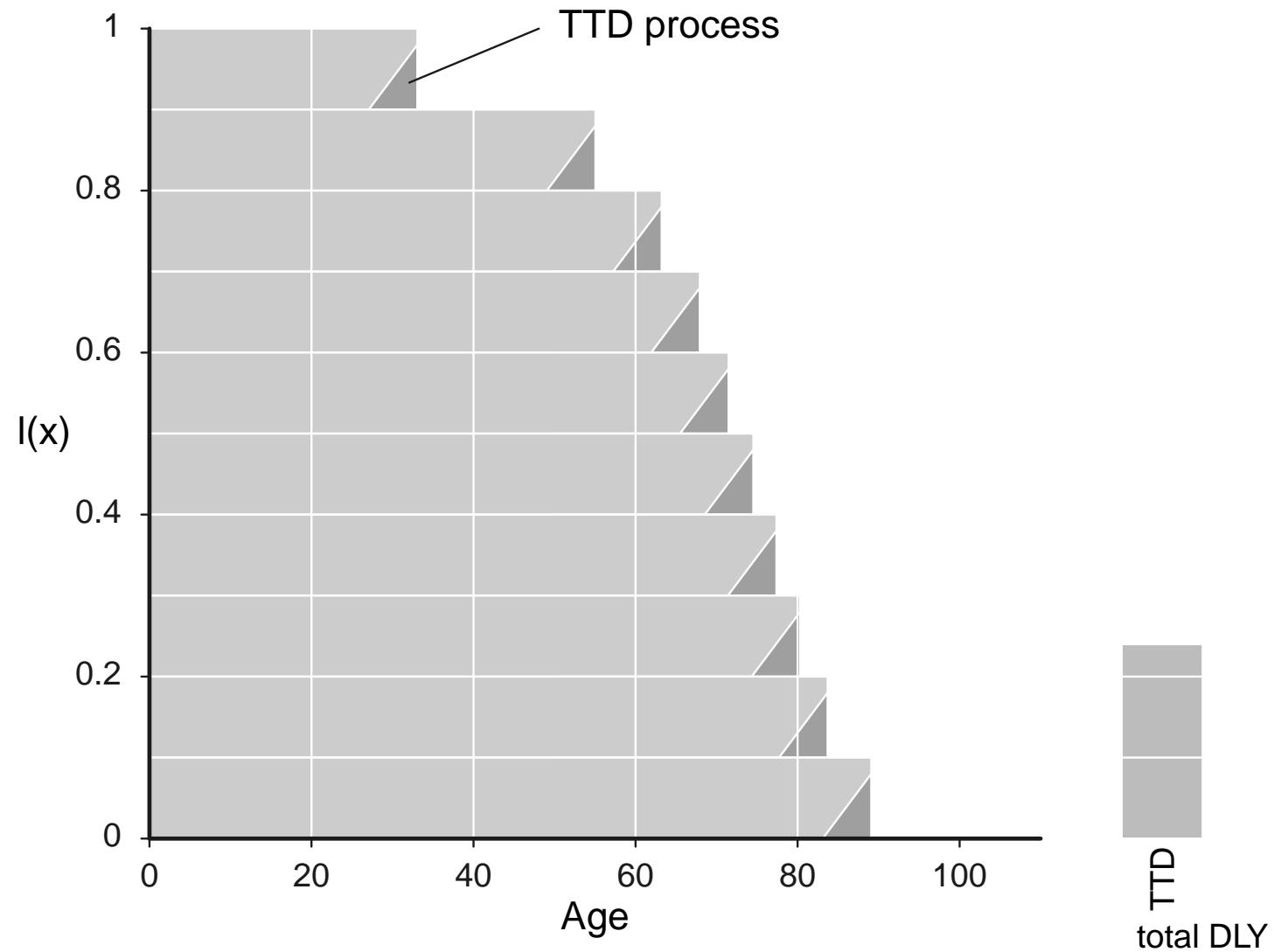
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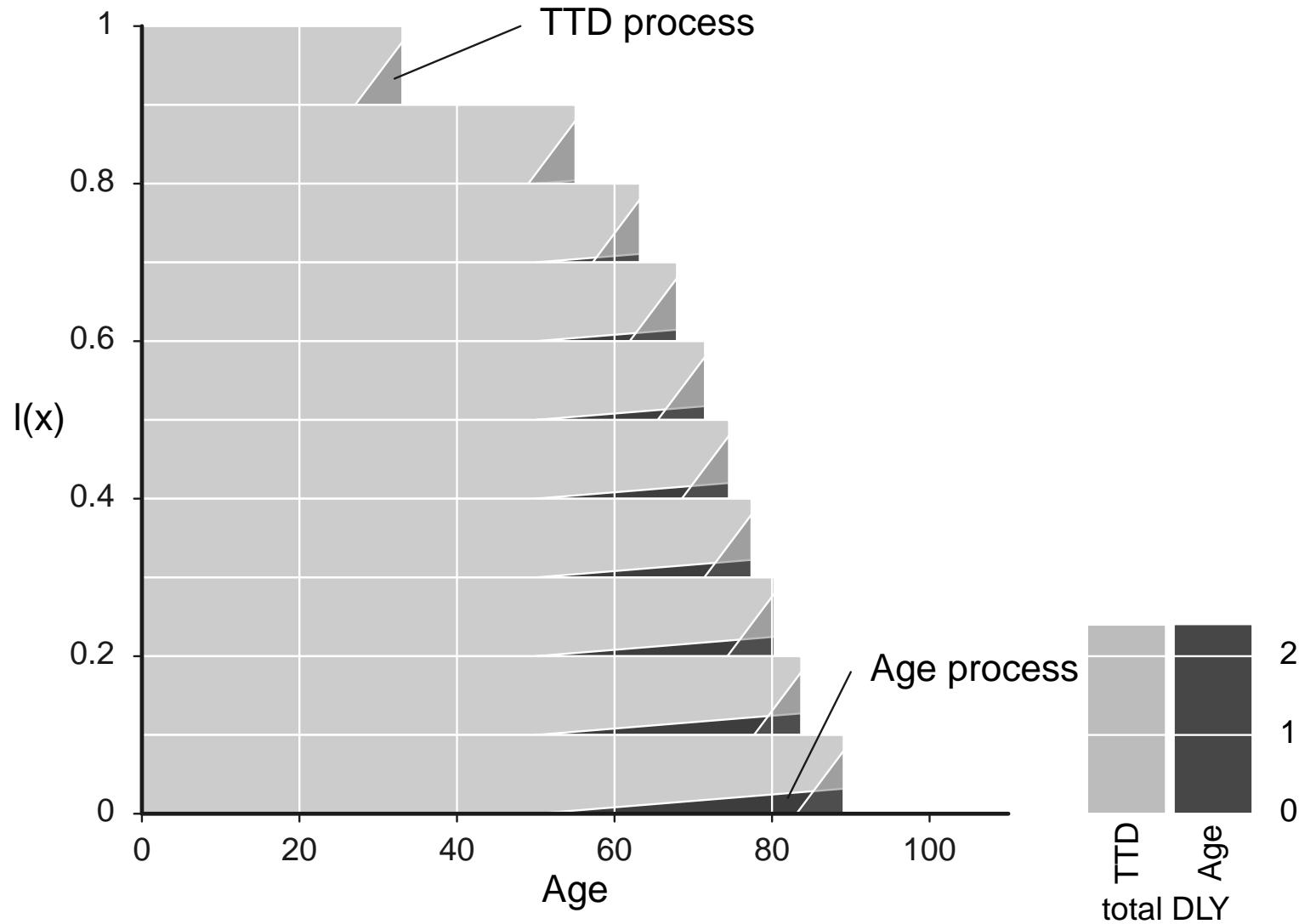
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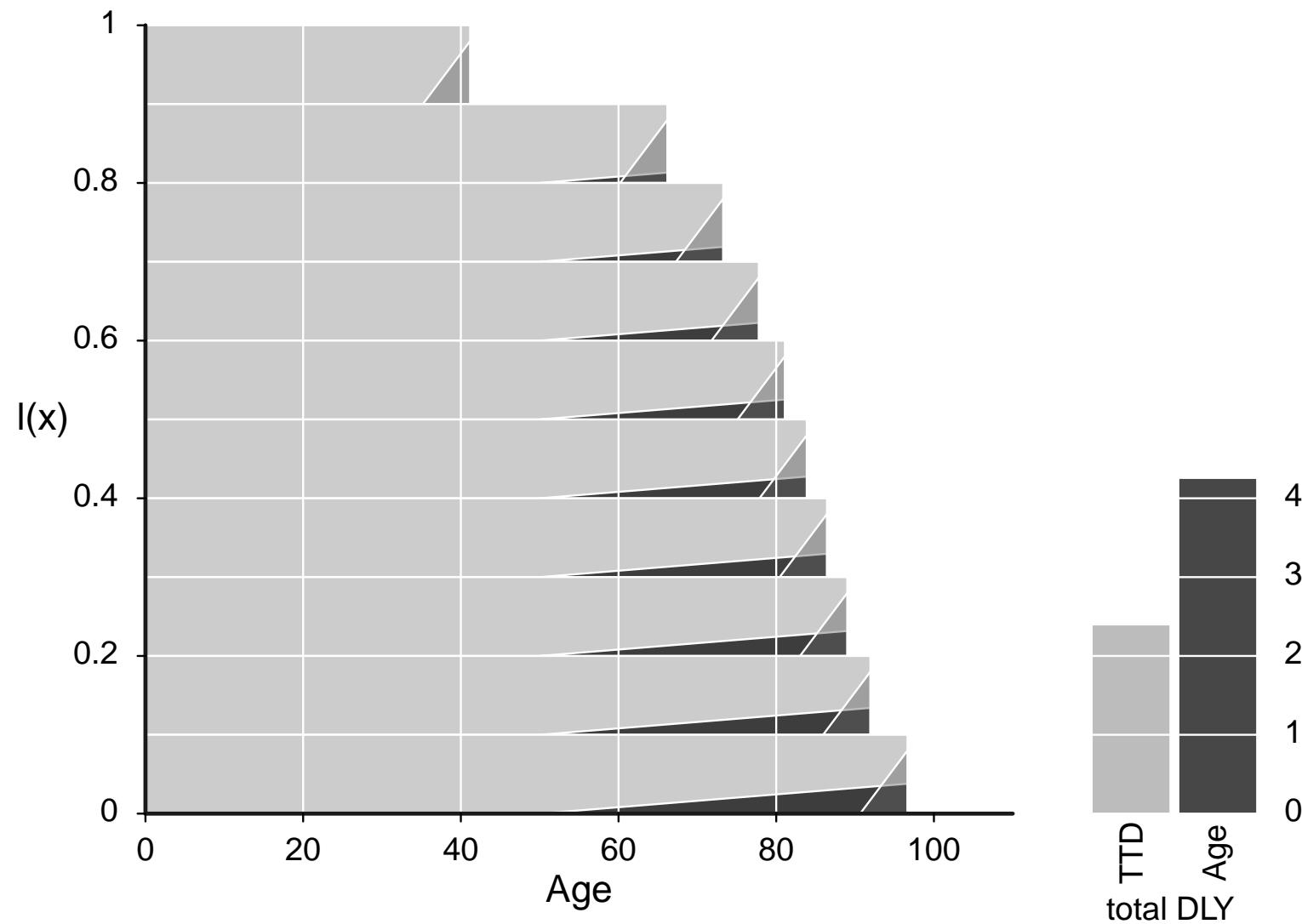
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Compression

Compression definition

The level of morbidity compression is the average proportion of life in good health, $\mathbb{C} = \frac{HLE}{LE}$.

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Objective:

Separate morbidity levels and morbidity dispersion.

Dispersion

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Morbidity dispersion, \mathbb{D} , is the average time-to-death of late-life morbidity prevalence.

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Formal definition

$$\mathbb{D} = \frac{\int_0^\omega y\pi^*(y) dy}{\int_0^\omega \pi^*(y) dy} \quad (1)$$

where y is time until death, and $\pi^*(y)$ is morbidity prevalence by time to death.

Dispersion

Dispersion definition

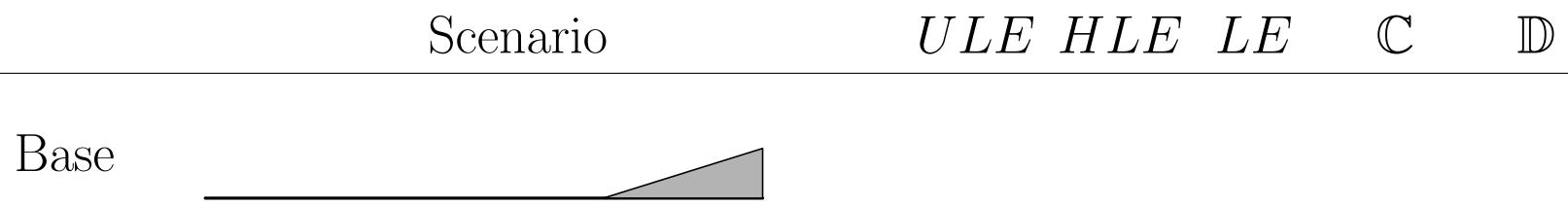
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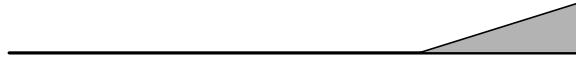
$$\mathbb{D} = \frac{\int_0^\omega y\pi^*(y) \, dy}{\int_0^\omega \pi^*(y) \, dy} \quad (1)$$

where y is time until death, and $\pi^*(y)$ is morbidity prevalence by time to death. Or one might rather weight a lifespan-varying $\pi(y, l)$, by the length-of-life distribution.

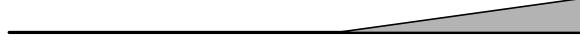
Scenarios



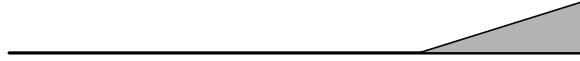
Scenarios

Scenario	<i>ULE</i>	<i>HLE</i>	<i>LE</i>	\mathbb{C}	\mathbb{D}	
Base			=	=	=	=

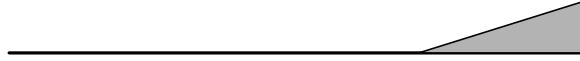
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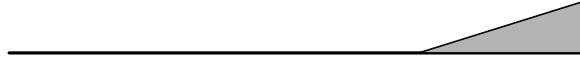
Scenarios

Scenario	<i>ULE</i>	<i>HLE</i>	<i>LE</i>	\mathbb{C}	\mathbb{D}
Base					
		\downarrow	\uparrow	$=$	\uparrow

Scenarios

Scenario	<i>ULE</i>	<i>HLE</i>	<i>LE</i>	\mathbb{C}	\mathbb{D}
Base					
		\downarrow	\uparrow	$=$	\uparrow \downarrow

Scenarios

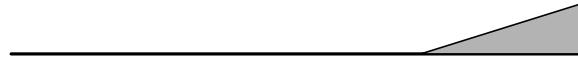
Scenario	<i>ULE</i>	<i>HLE</i>	<i>LE</i>	\mathbb{C}	\mathbb{D}
Base					
		\uparrow	\downarrow	$=$	\downarrow

Scenarios

Scenario

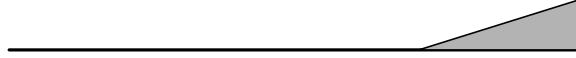
ULE HLE LE \mathbb{C} \mathbb{D}

Base

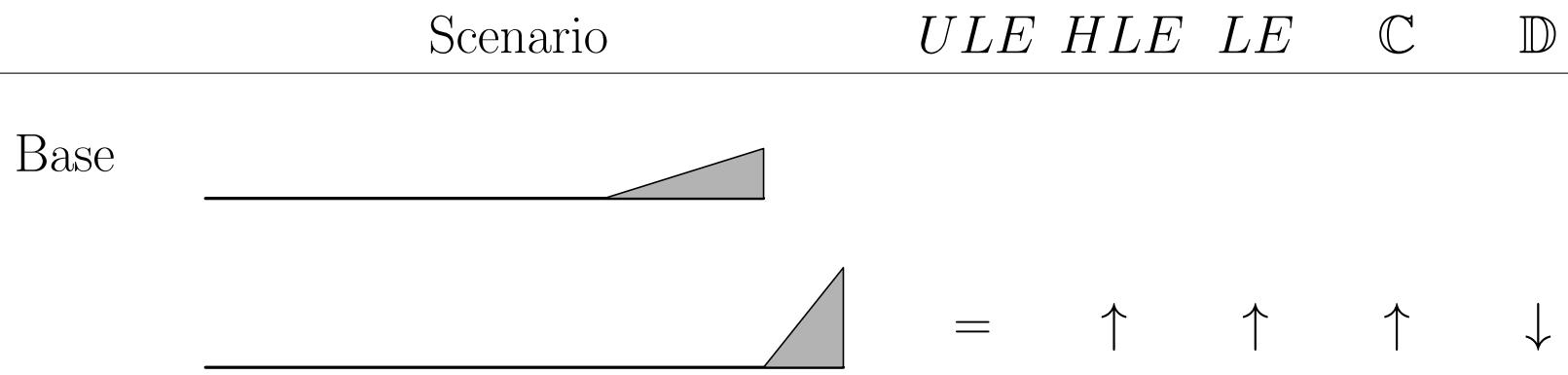


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Scenarios

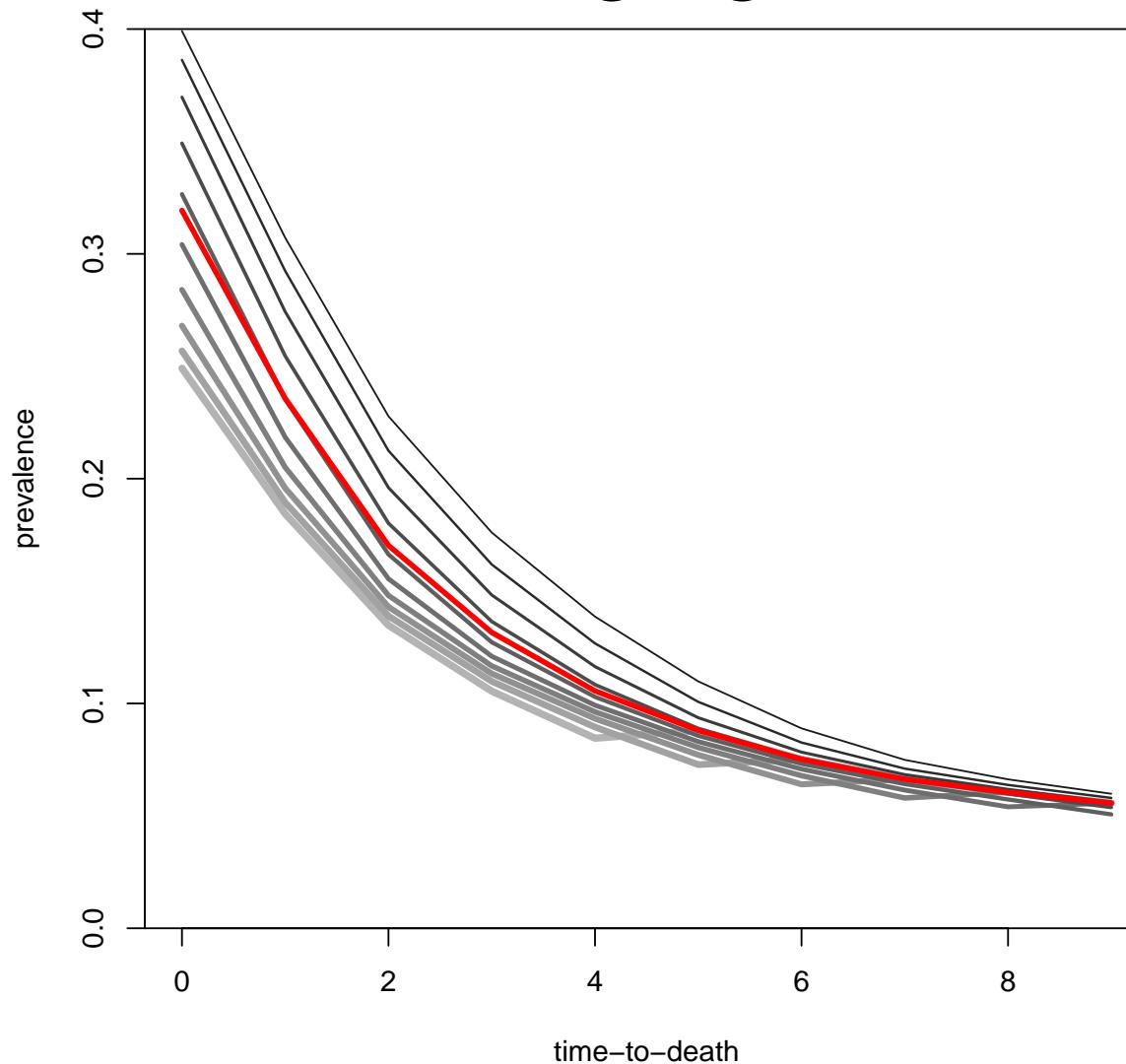
Scenario	ULE	HLE	LE	C	D
Base					
		↑	↑	↑	↓

Scenarios



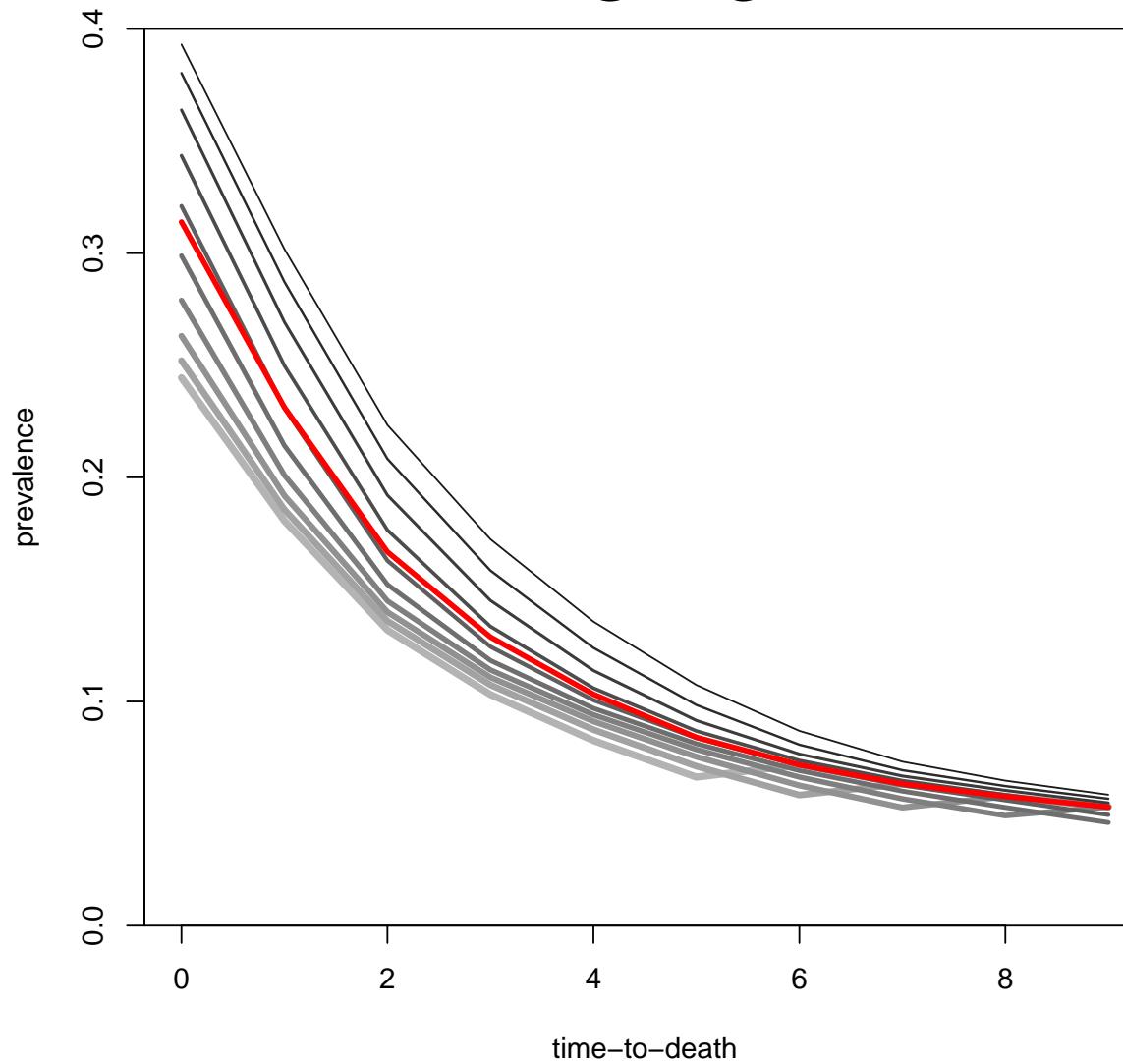
Observed time-to-death patterns (HRS, ADL3)

1915



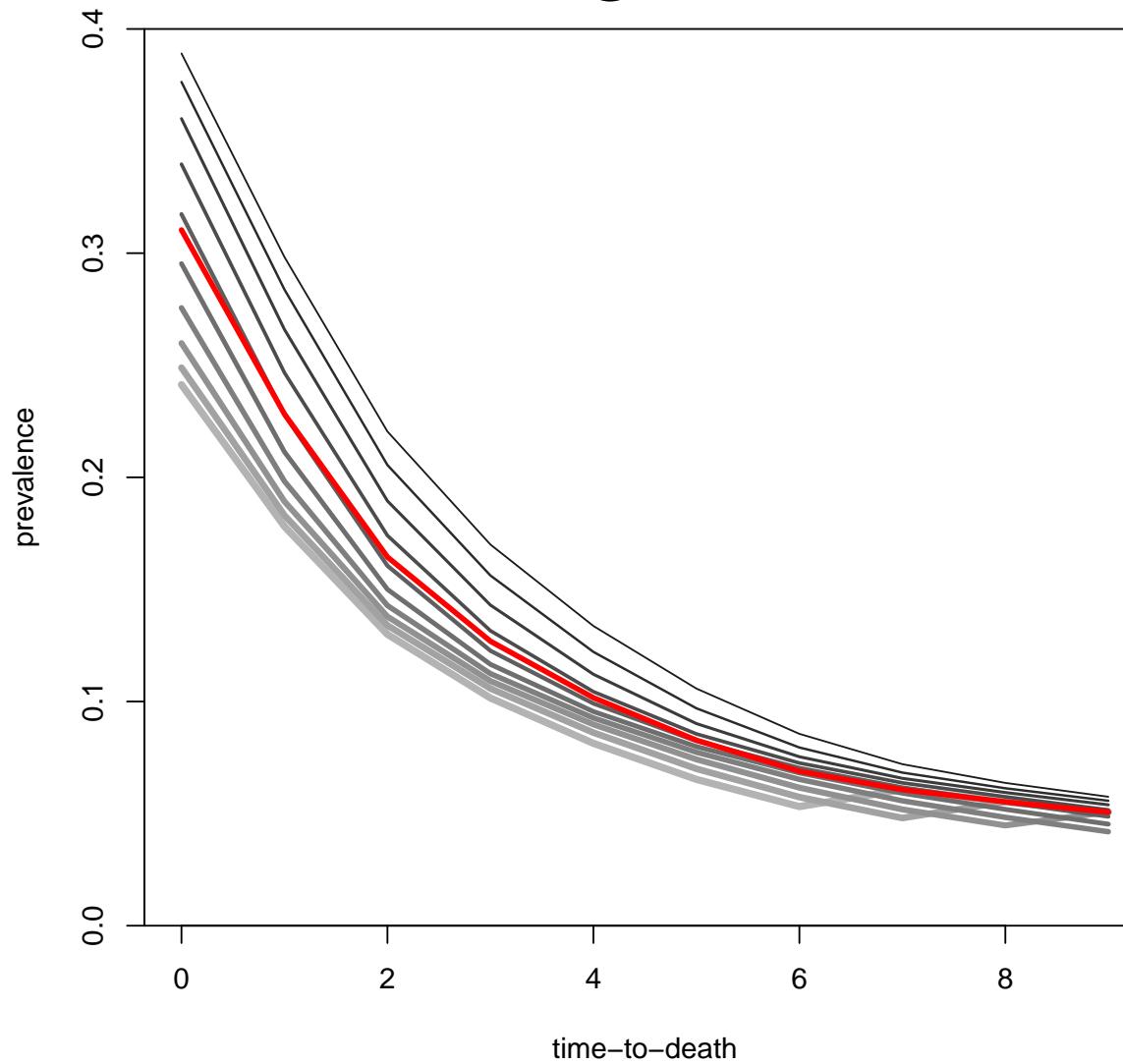
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1916



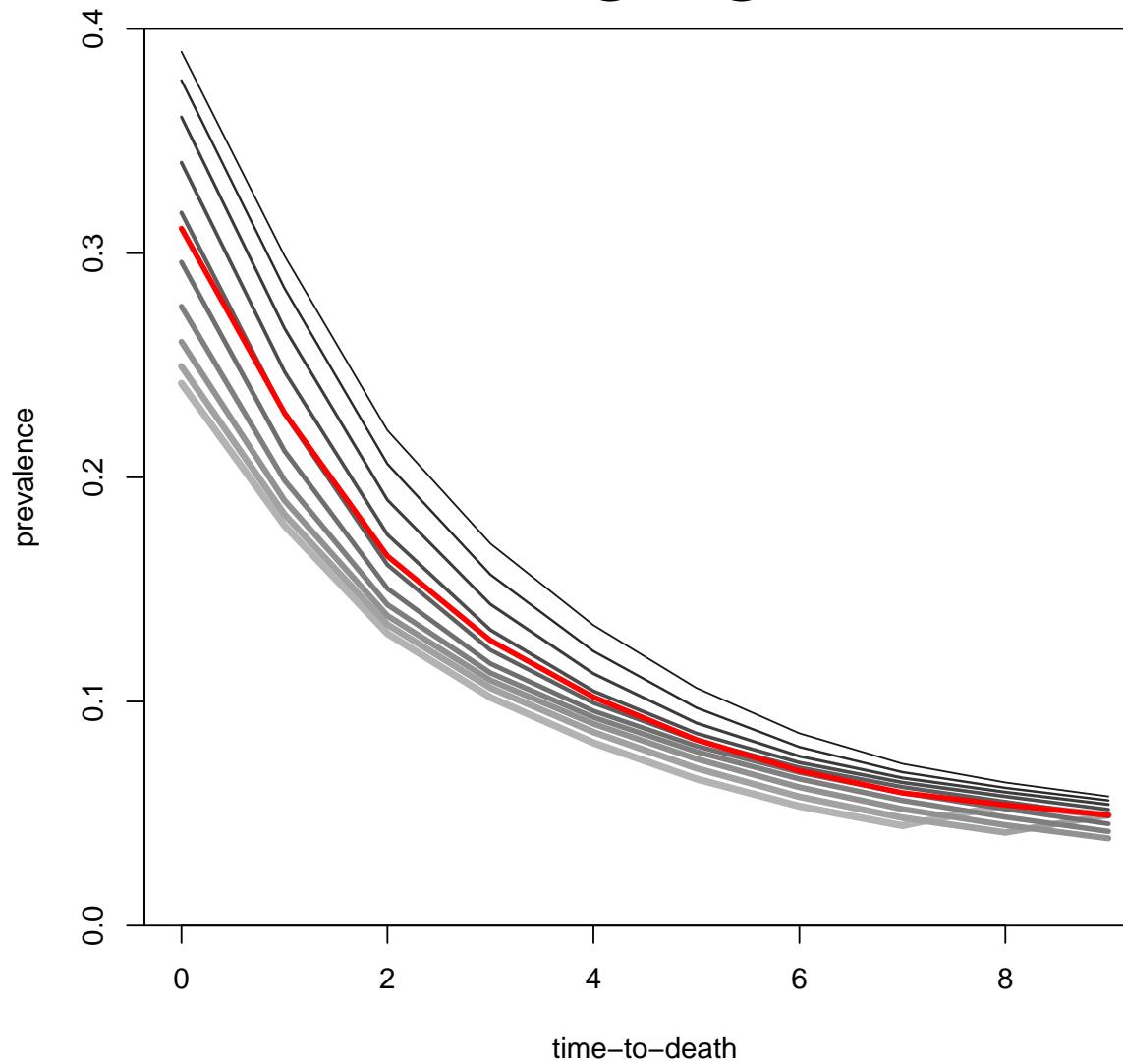
Observed time-to-death patterns (HRS, ADL3)

1917



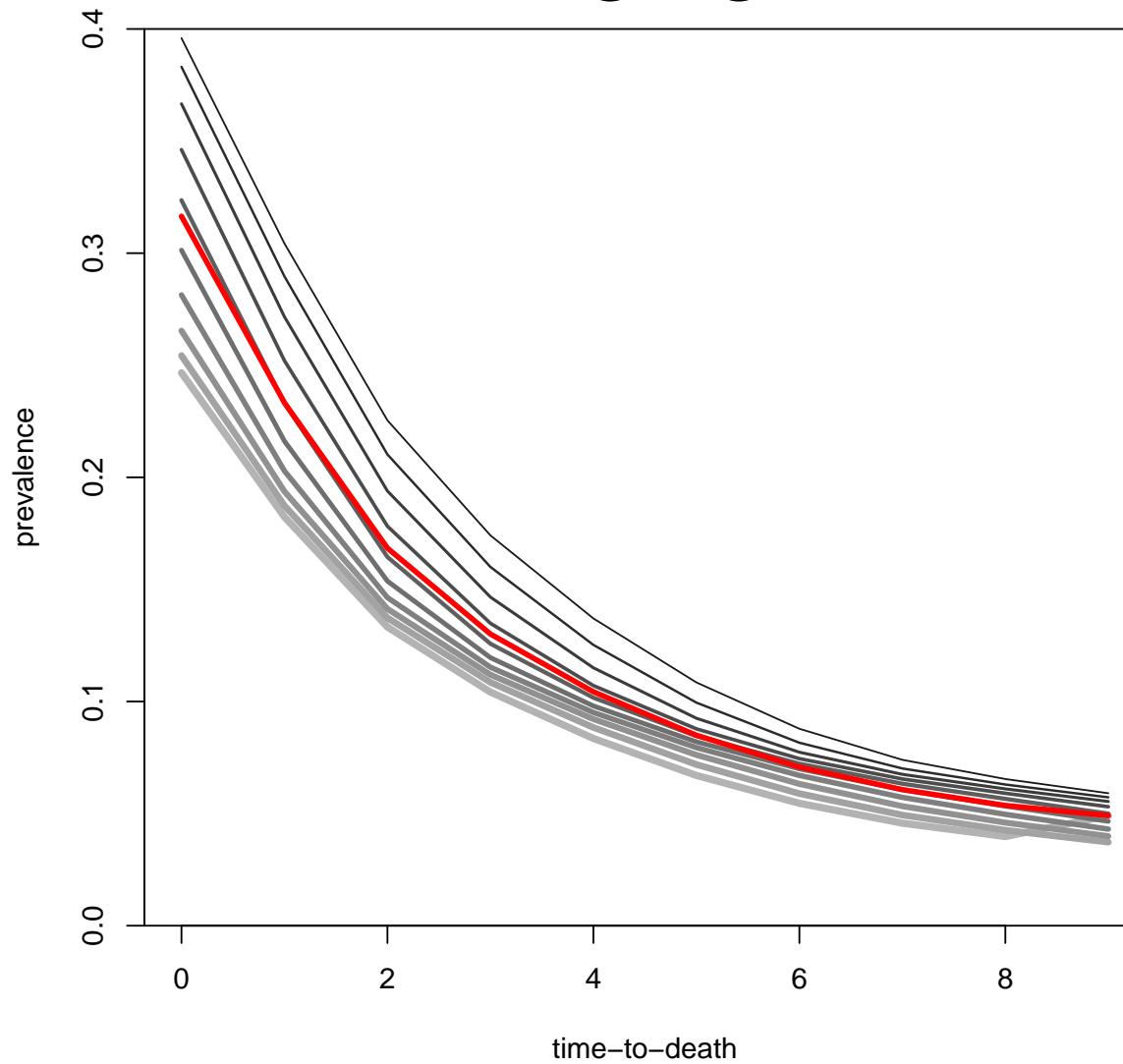
Observed time-to-death patterns (HRS, ADL3)

1918



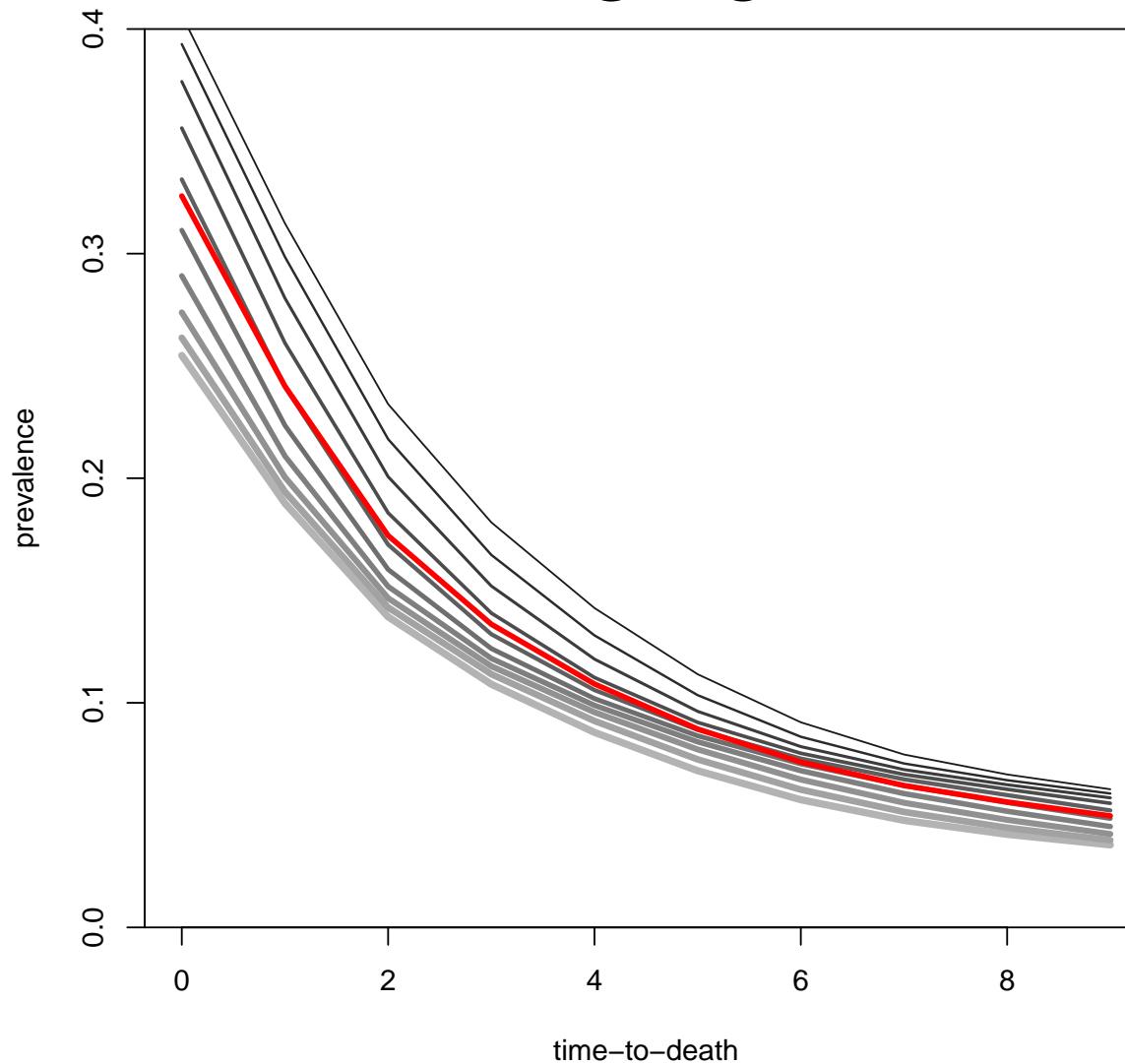
Observed time-to-death patterns (HRS, ADL3)

1919



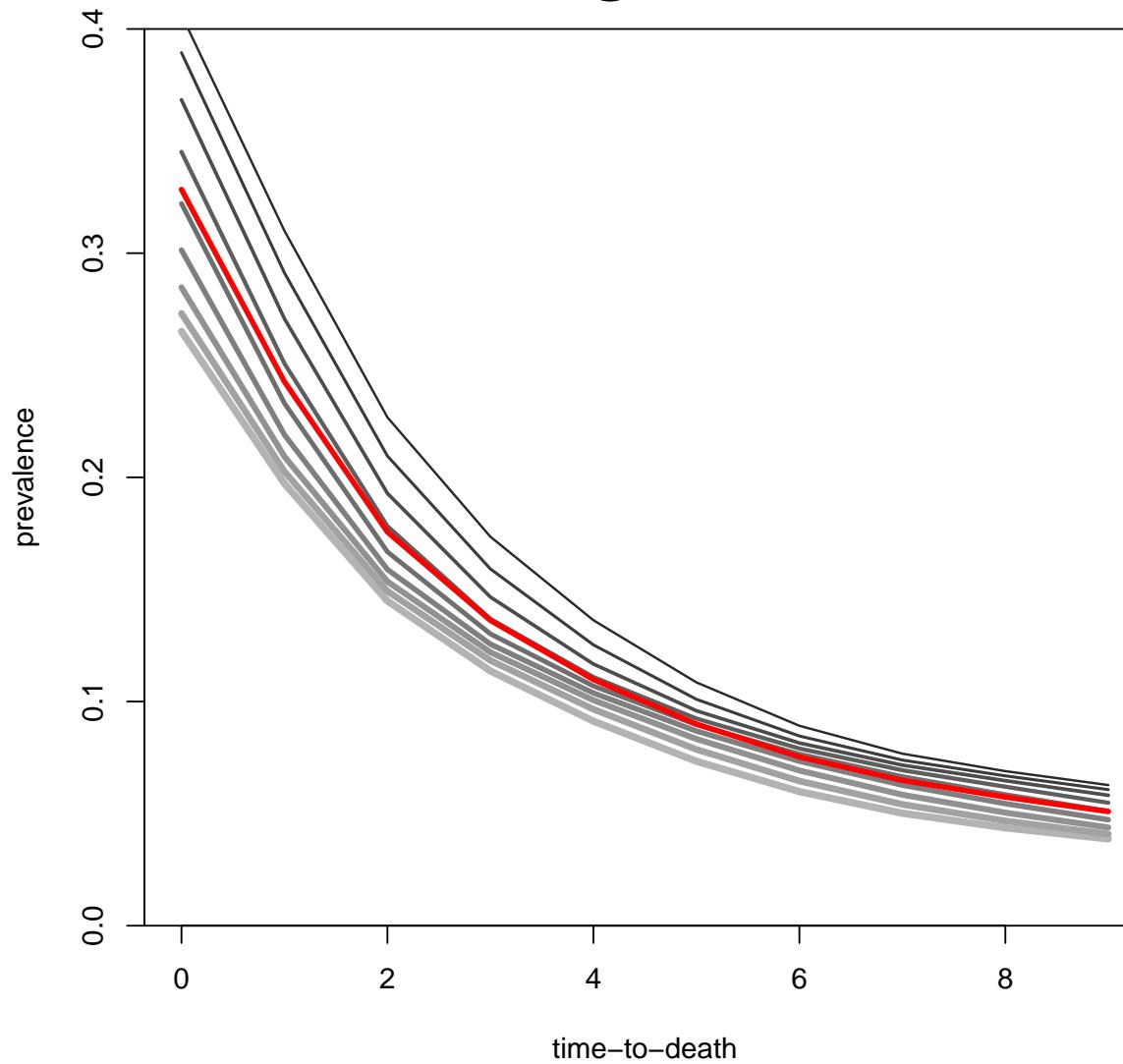
Observed time-to-death patterns (HRS, ADL3)

1920



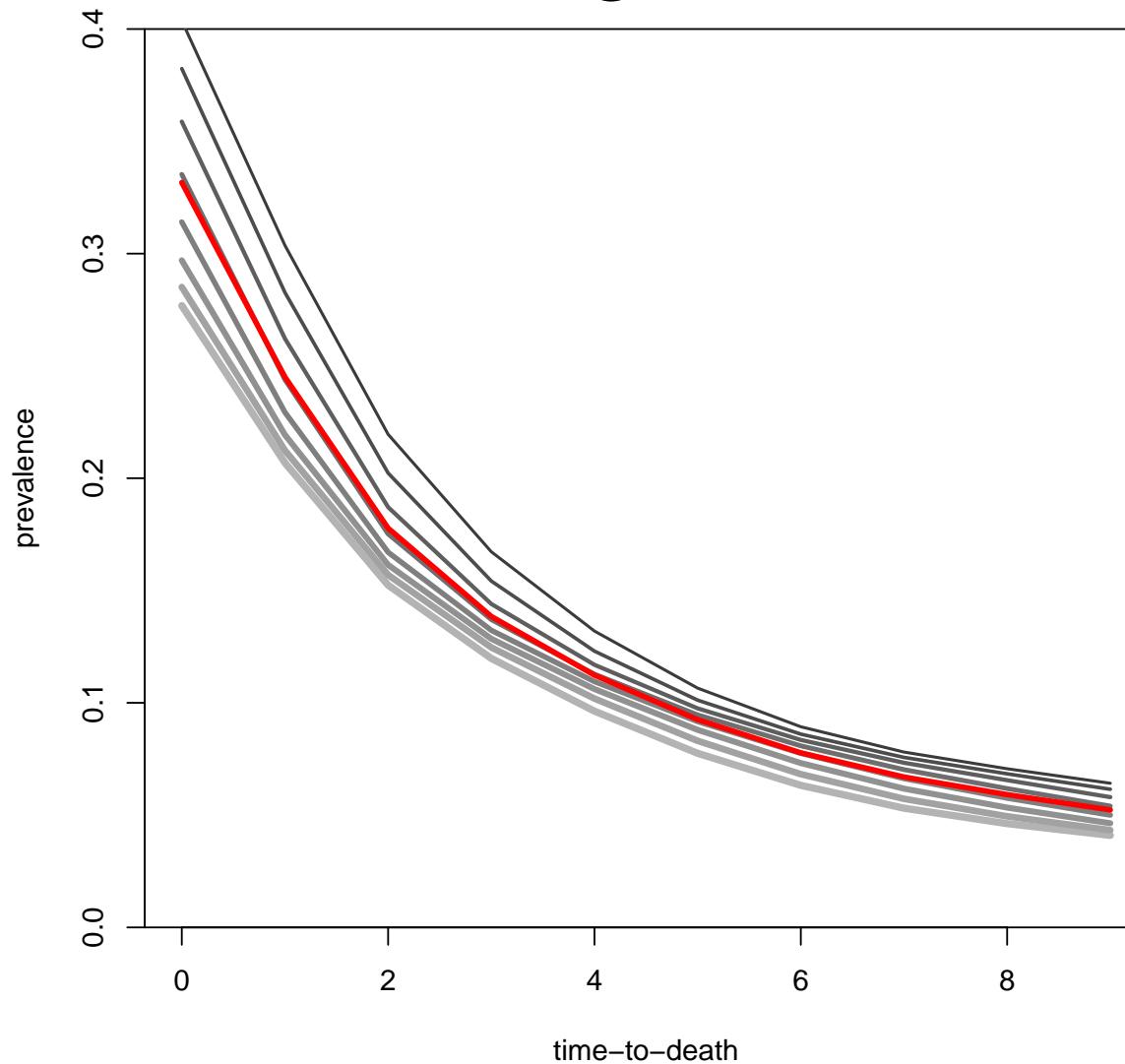
Observed time-to-death patterns (HRS, ADL3)

1921



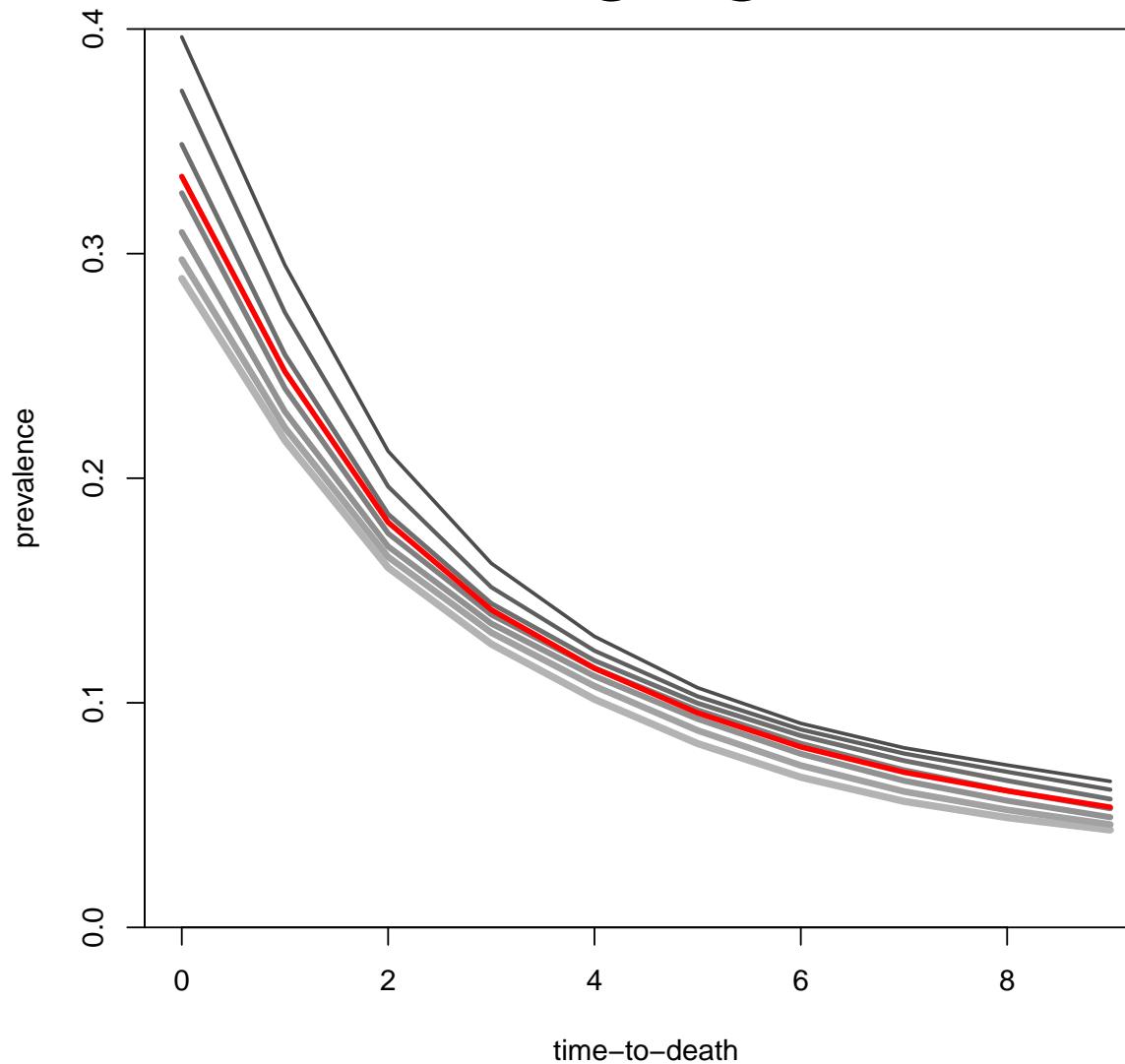
Observed time-to-death patterns (HRS, ADL3)

1922



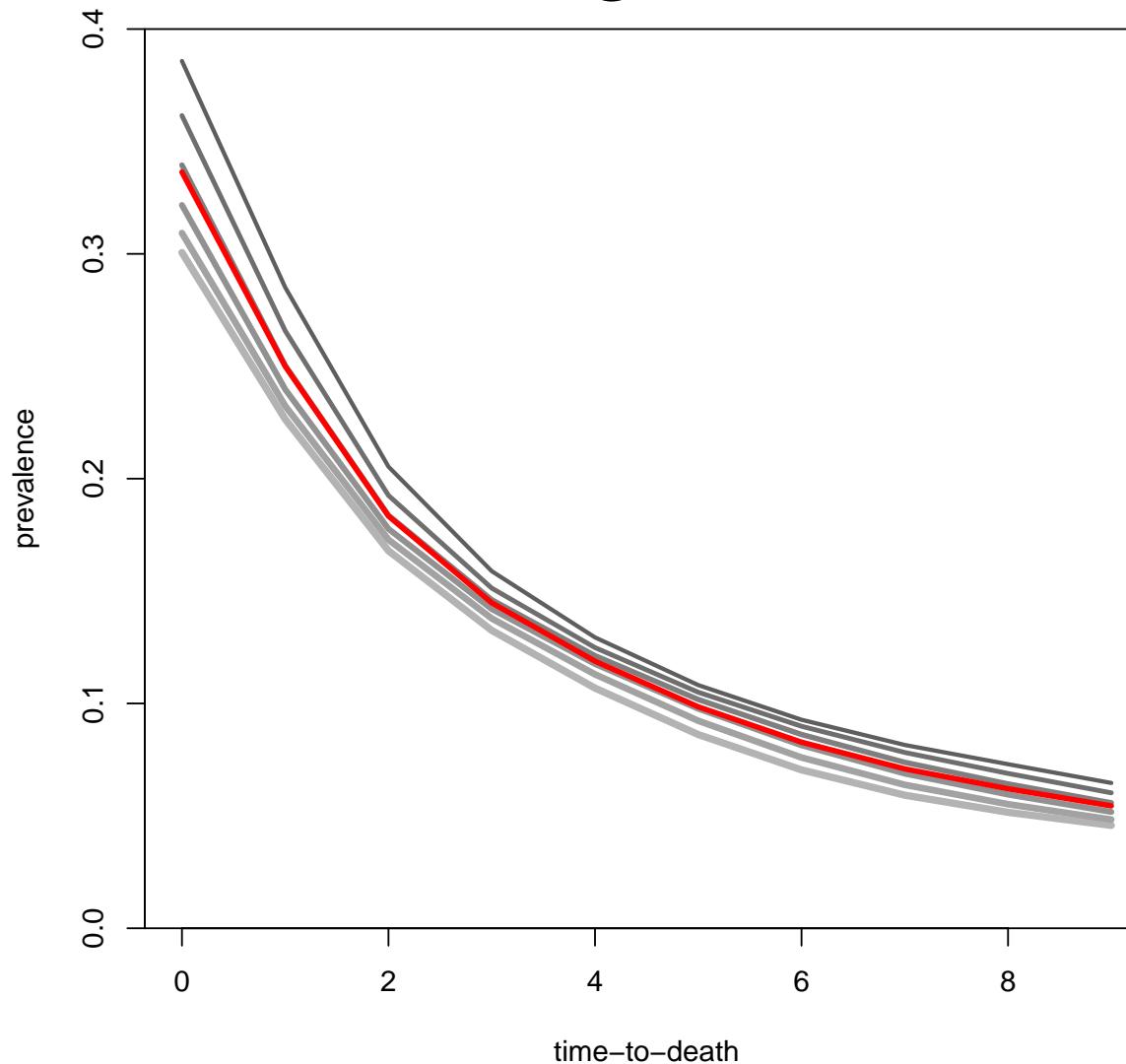
Observed time-to-death patterns (HRS, ADL3)

1923



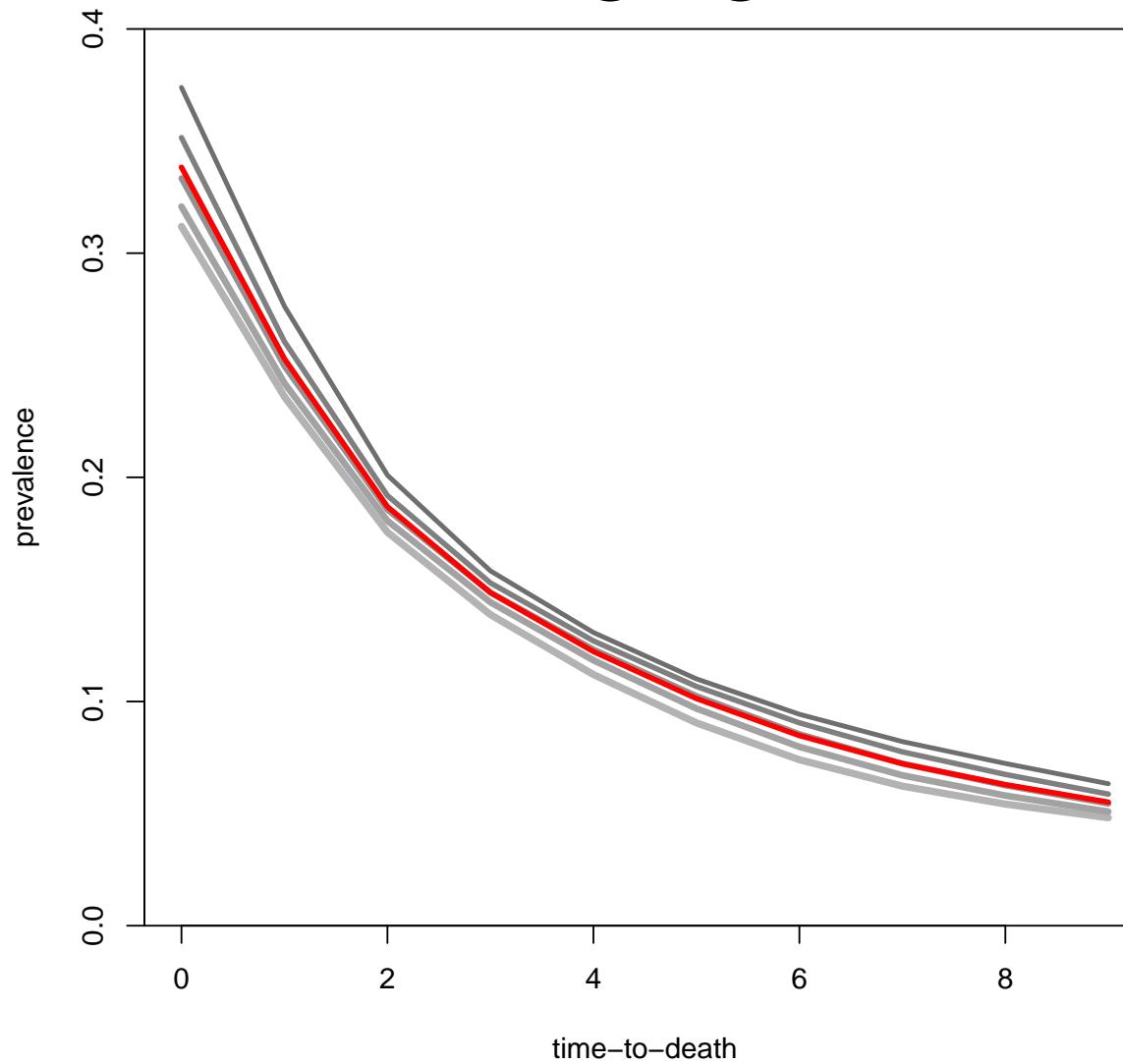
Observed time-to-death patterns (HRS, ADL3)

1924



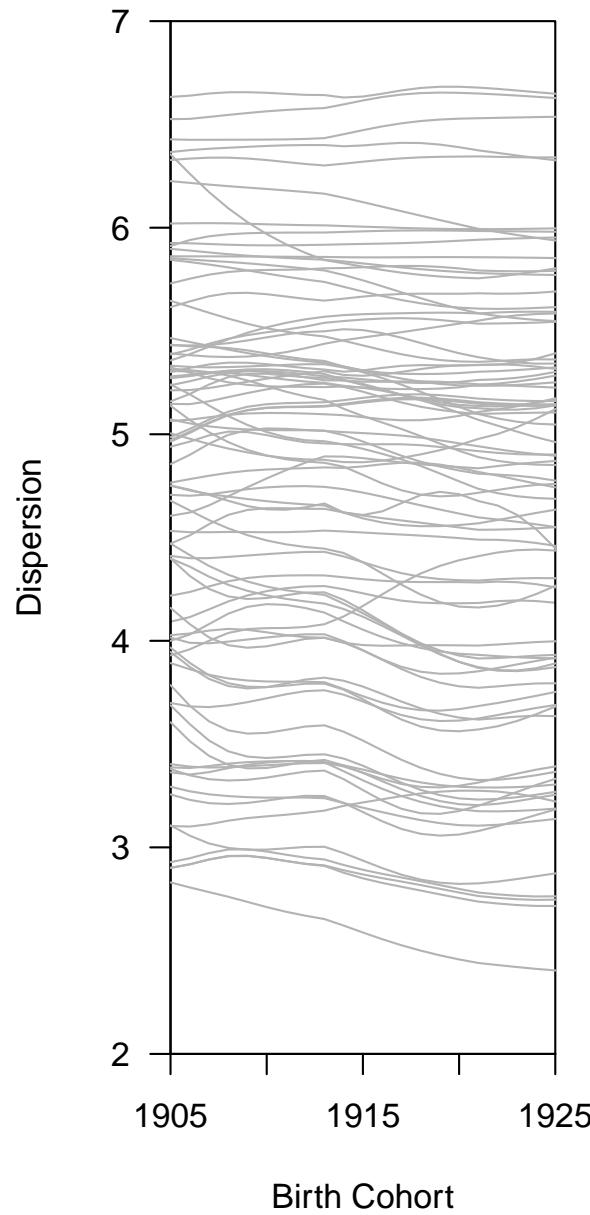
Observed time-to-death patterns (HRS, ADL3)

1925

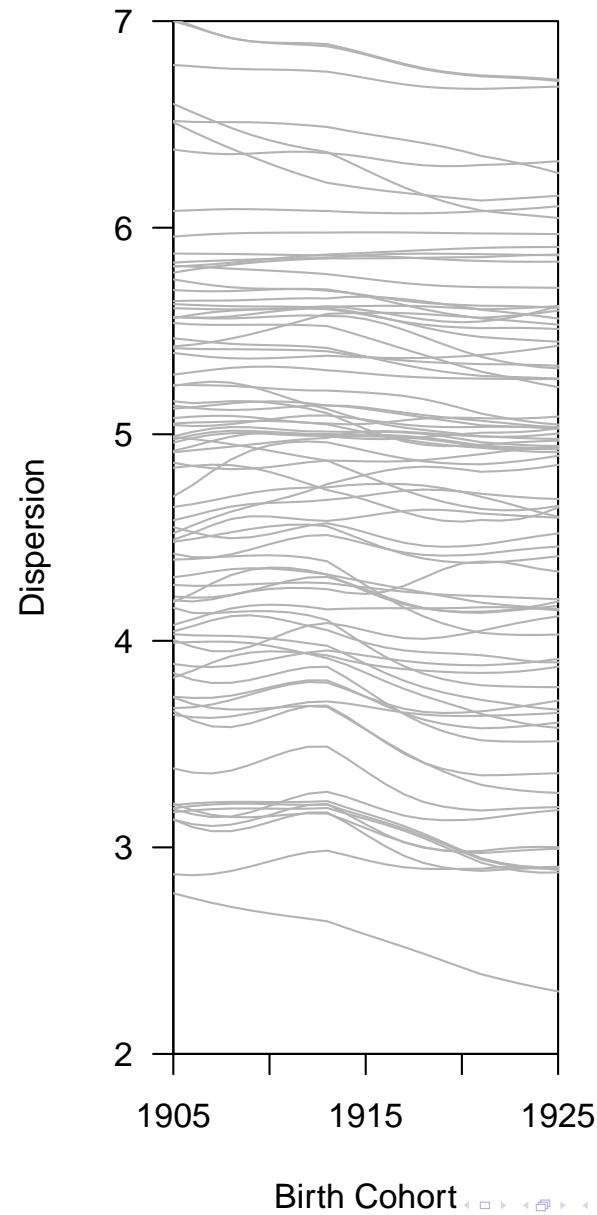


Results from HRS (RAND, vP), 82 measures

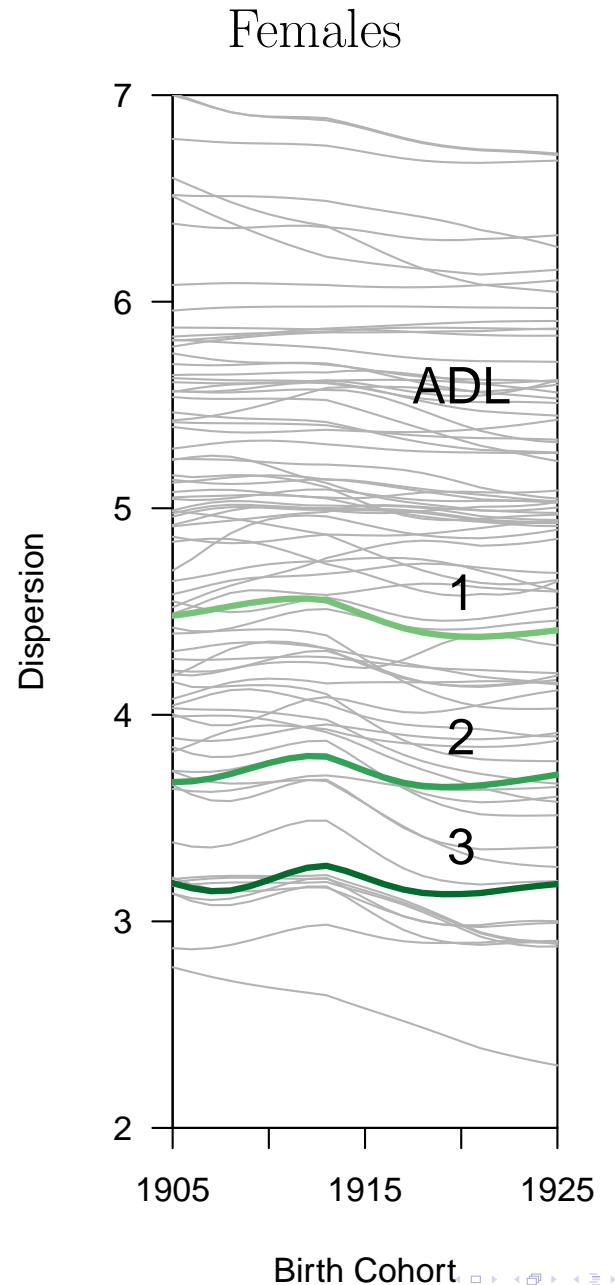
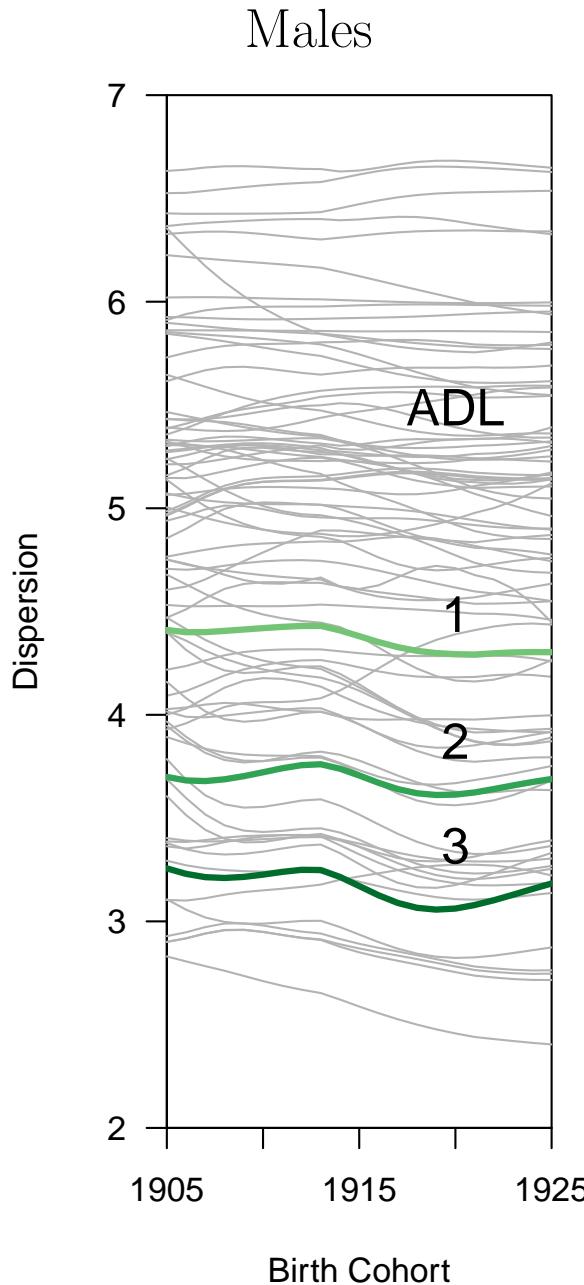
Males



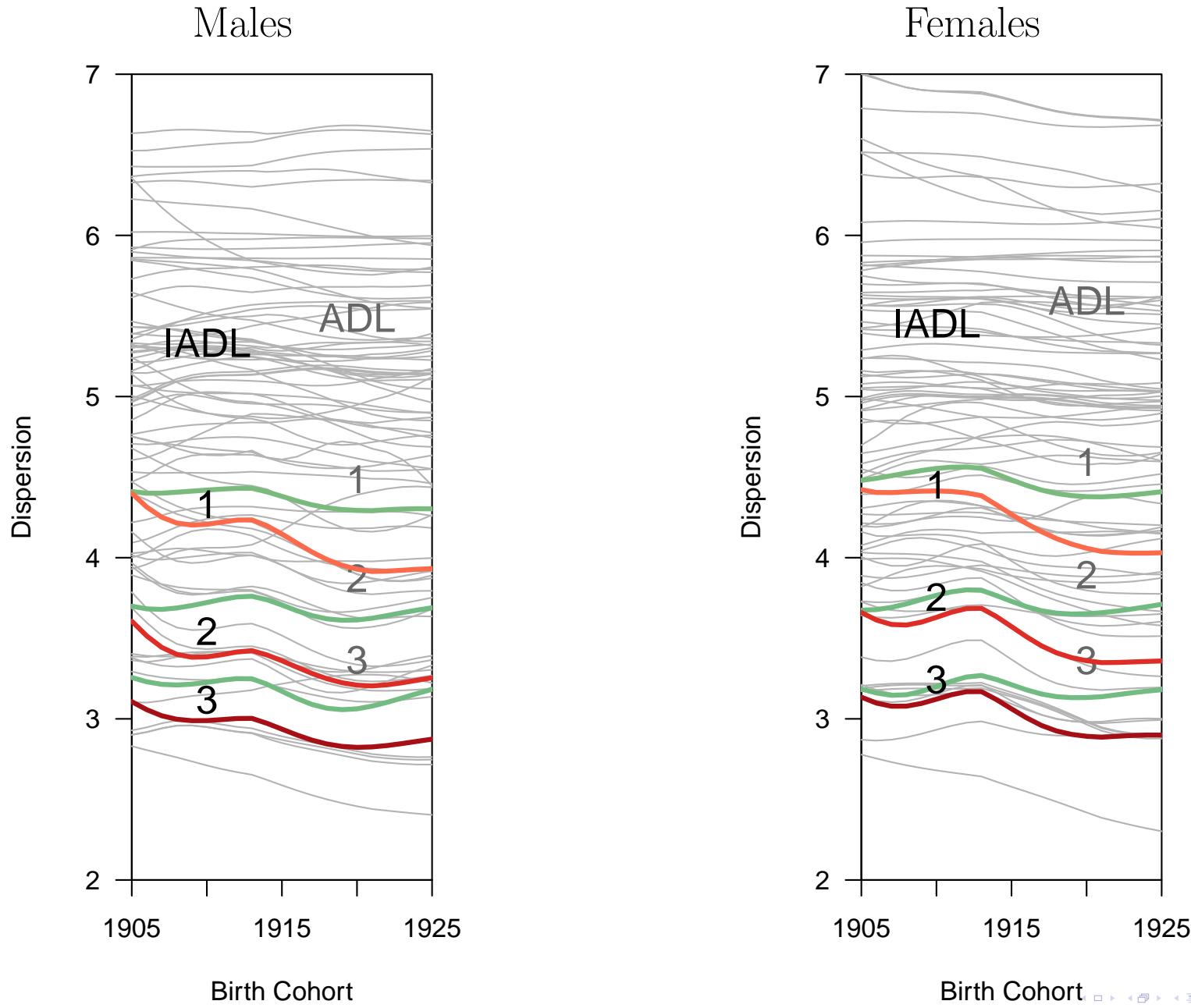
Females



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Summary

Measures

Dispersion measures an aspect of the shape of morbidity prevalence, and it is a complementary index to compression.

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Trends

Dispersion of most morbidities changed less than 10% between the 1905 and 1925 cohorts, mostly in the direction of increased concentration of poor health conditions at the end of life.

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Dispersion measures an aspect of the shape of morbidity prevalence, and it is a complementary index to compression.

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Limitations

This measure requires follow-up until death (but stable patterns might make prevalence less risky to extrapolate).