<Appendix>

Umezaki, 20 Nov 2007

Gage TB ( ) Population variation in cause of death: level, gender and period effects. Demography, 31: 271-296.

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① ⊙ Siler Competing Hazard Model

$$h_t = a_1 e^{-b_1 t} + a_2 + a_3 e^{b_3 t}$$

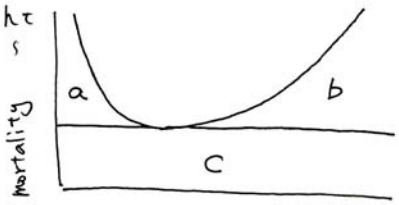
negative Gompertz function | constant | Gompertz function

↓

$\int_0^{80} = a$: immature mortality ∫ infant

$\int_0^{80} = c$: residual mortality ∫ overall

$\int_0^{80} = b$: senescent mortality ∫ aging

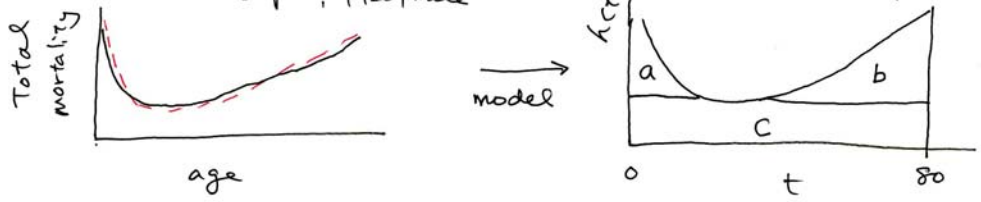


a+b+c = cumulative hazard (0-80 years)

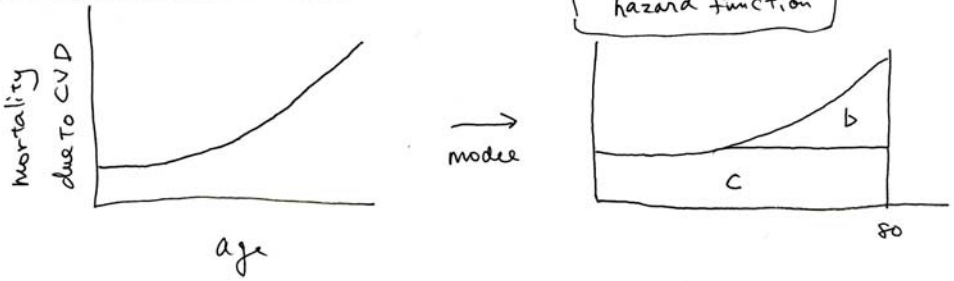
- a: cumulative hazard of immature deaths
- c: cumulative hazard of residual deaths
- b: c H of aging death

② ◦ Parameters estimated.

Life table — Japan, 1920, male



Disease-specific life table



(ex) (3)

			a+b+c	a	b	c
Japan	1920	$L_0 = 55$	3	0.5	0.4	2.1
	1940	$L_0 = 60$	2.5	0.3	0.3	1.9
	1960	$L_0 = 68$	2	0.2	0.2	1.6
	1980	$L_0 = 75$	1.5	0.1	0.1	1.3

→ Fig 6, Fig 11 in Gage (2005)

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(4) — $h_i = c + \beta_1(e_0) + \beta_2(g) + \beta_3(e_0 \times g) + \beta_4(p)$

i = component (a or b or c)
e_0 = life expectancy
g = gender (male or female)
$e_0 \times g$ = interaction term.
p = period

When applied to 100 lifetables, least square regression

Unit = lifetable.

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(5) $h_{ij} = c + \beta_1(e_0) + \beta_2(g) + \beta_3(e_0 \times g) + \beta_4(p) + \beta_5(h_{i,v})$

j = cause of death (CVD, neoplasms, or ..)

$h_{i,v}$ = component-specific hazard rate due to "other and unknown" cause

β_5 = negative → h_{ij} reduced due to "other and unknown" cause.

Truese	CVD	Category	CVD	unknown
	100		20	80