

The Standard Mortality Table 2007



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Tatsuhiko Yamakawa
Sumitomo Life Insurance Company



Overview

0. Trends in Mortality of the Japanese Population

1. History of Mortality Table in Japan

2. Revision of the SMT

3. Construction Process for the SMT 2007

3.1 For Life Coverage

3.2 For Annuitants

3.3 For Third-Sector Products

4. Arguments about the SMT 2007

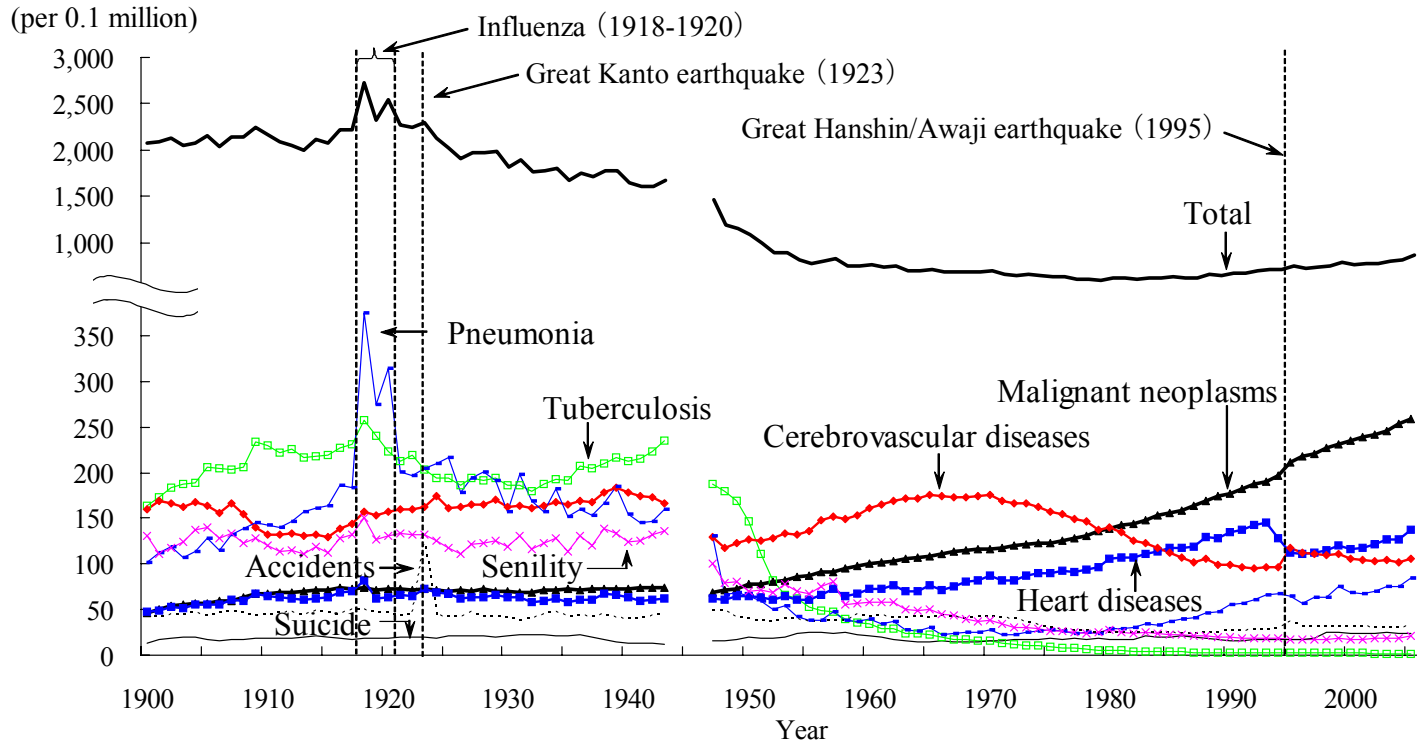


0.1 Trends in Mortality of the Japanese Population

- After around 1980, the mortality increased because of population aging.
- With regard to causes of death,
 - Before World War II, mainly epidemics.
 - Since about 1960, adult diseases (M.N., H.D., C.V.D.) have been the leading three.
- The age-adjusted mortality is decreasing.

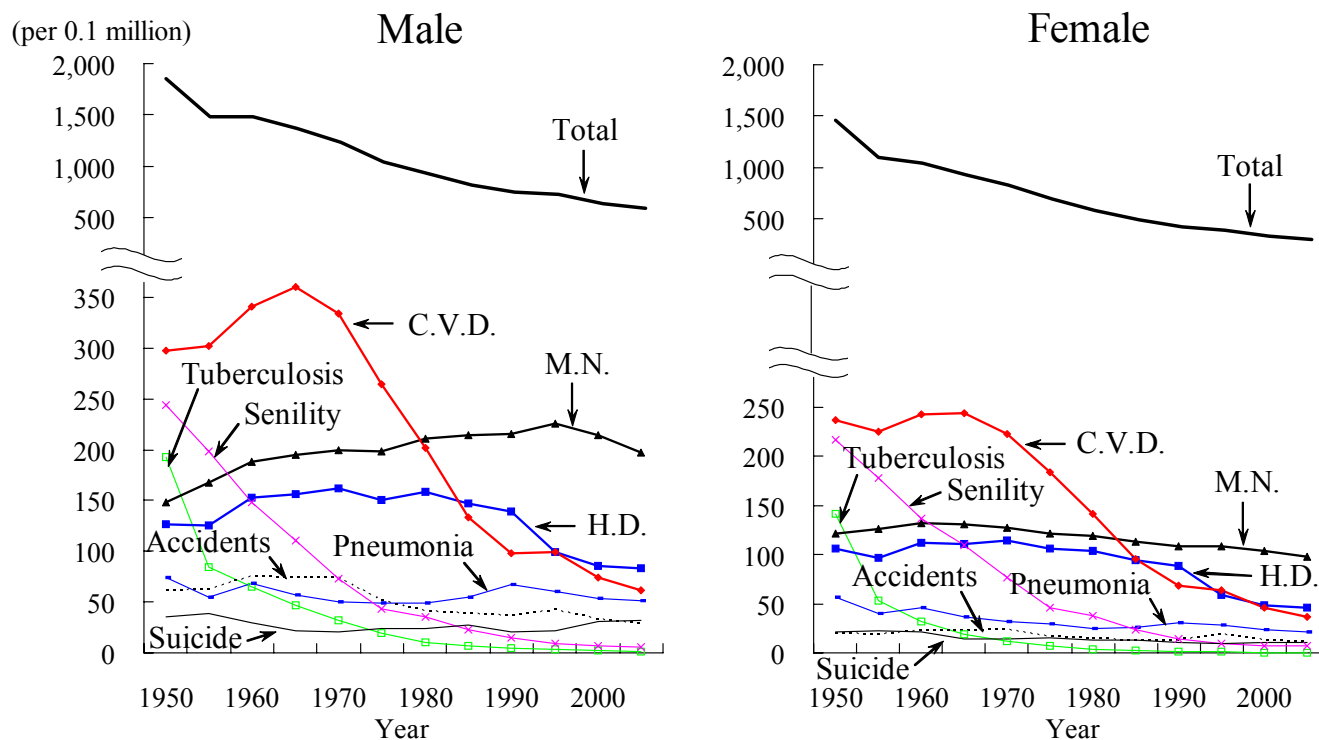
0.1 Trends in Mortality of the Japanese Population (cont'd)

- Mortality by causes of death



0.1 Trends in Mortality of the Japanese Population (cont'd)

- Age-adjusted mortality by causes of death





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1.1 Population Tables

- The Ministry of Health, Labour, and Welfare prepares two series of life tables.

(i) Complete Life Tables

- Constructed every 5 years.
- The 20th Life Tables (2005) are the latest.

(ii) Abridged Life Tables

- Constructed every year.
- The Tables for 2006 are the latest.

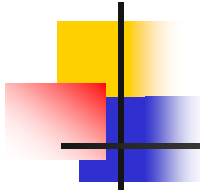


1.2 Experience Tables before 1996

- The Life Insurance Association of Japan (LIAJ) developed five experience tables before 1996.

Name of Table	Published in	Observed Year
The 1st Experience Table	1969	1960-'63
The 2nd Experience Table	1974	1965-'69
The 3rd Experience Table	1981	1972-'76
The 4th Experience Table	1985	1979-'80
The 5th Experience Table	1990	1984-'85

- The LIAJ has been collecting experience data.



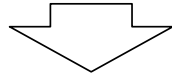
1.3 Introduction of Standard Valuation System

- The Insurance Business Law was revised in 1996, and the Standard Valuation System was introduced.
 - (i) Net level premium reserves (locked-in method)
 - (ii) The standard calculation bases
 - The standard interest rate
 - The standard mortality table: The Life Insurance Companies Standard Mortality Table 1996

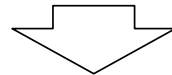


1.4 Flow of the SMT Development

- The LIAJ provides the experience data.



- The IAJ (Institute of Actuaries of Japan) develops the SMT.



- The FSA validates the SMT.



1.5 Development of the SMT 1996

- The SMT 1996 consists of two separate tables.

(i) For life coverage

- The construction method is similar to that of the previous experience tables.

(ii) For annuitants

- The SMT 1996 is the projection of the 15th Complete Tables (1980).



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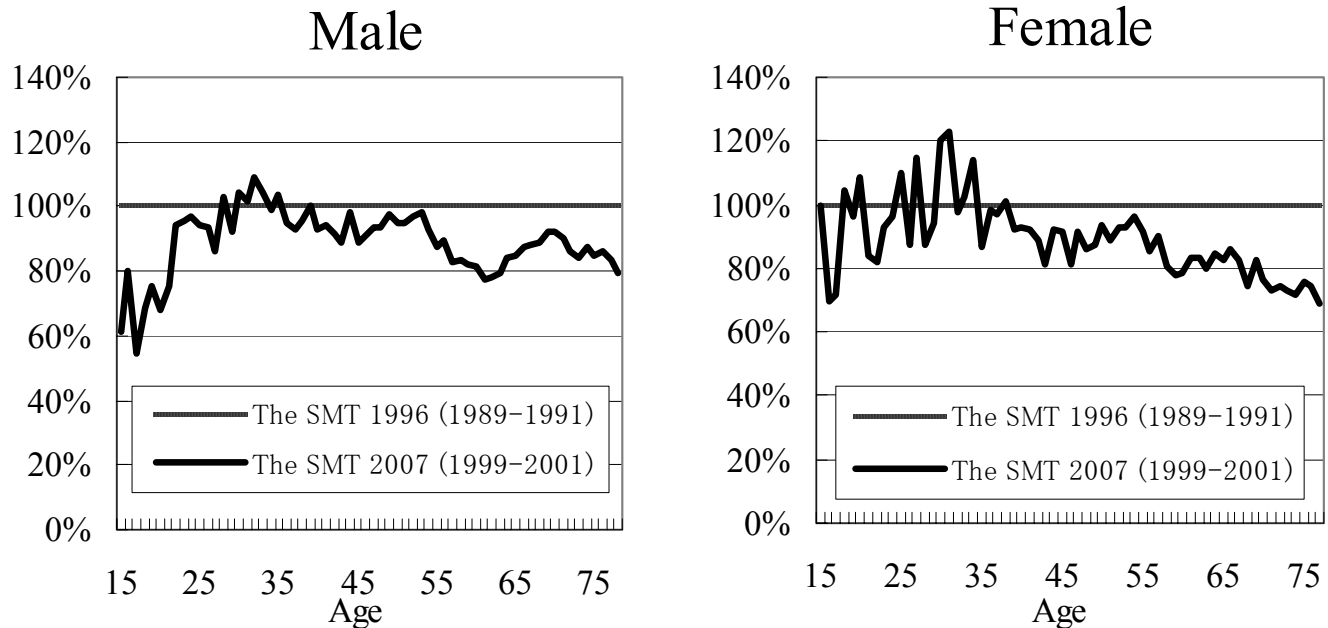


2.1 Background

- Since the SMT 1996 was developed, the mortality experience has been improving up until 2000, especially for older ages.
- From 2000 on, the mortality of the Japanese population has been continuously improving.
- The SMT 1996 for annuitants is lower than the population tables in older ages.

2.1 Background (cont'd)

- The crude mortality of the SMT for life coverage

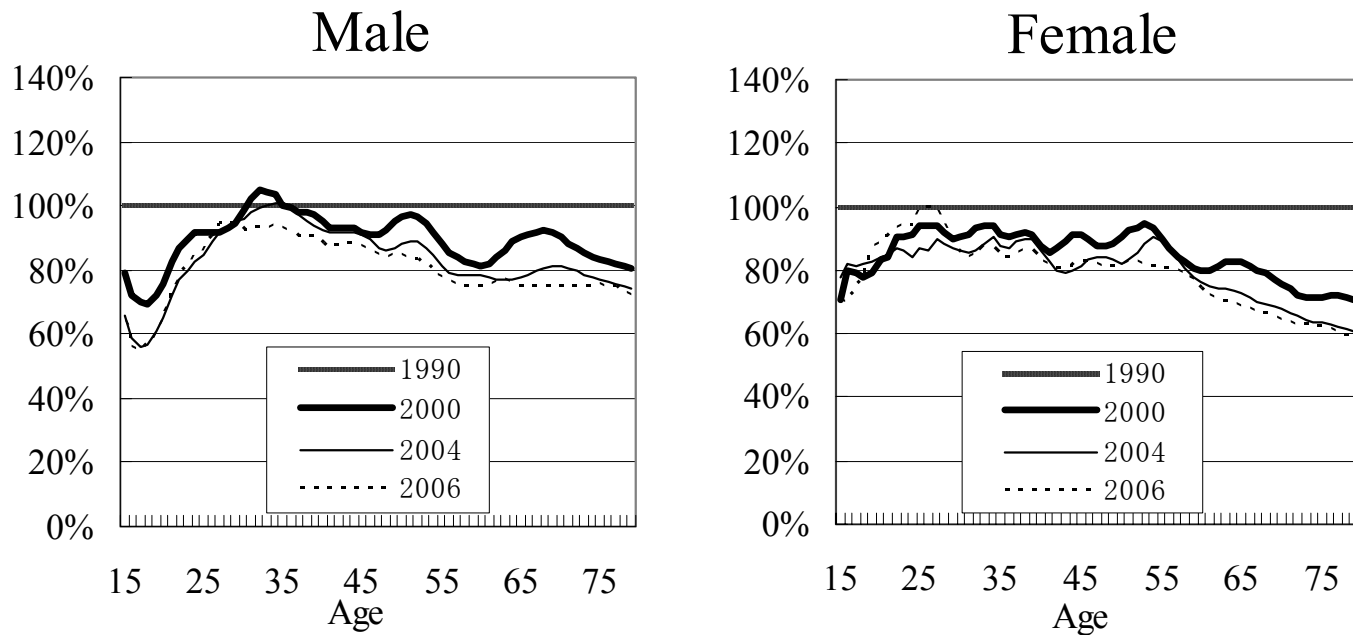


Note: Let the crude mortality of the SMT 1996 equal 100%.



2.1 Background (cont'd)

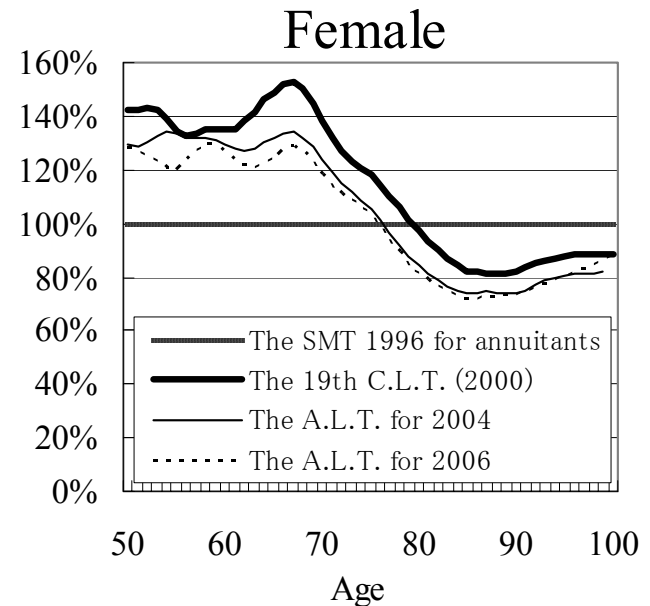
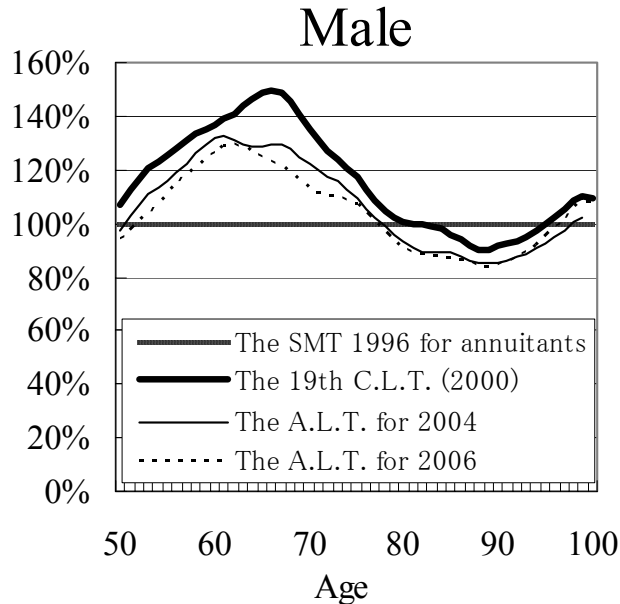
- The Abridged Life Tables



Note: Let the Abridged Life Tables for 1990 equal 100%.

2.1 Background (cont'd)

- The SMT 1996 for annuitants and the population tables

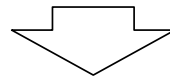


Note: Let the SMT 1996 for annuitants equal 100%.



2.2 Revision of the SMT

- The SMT for annuitants
 - Conservativeness of the SMT 1996 for annuitants has become insufficient for longevity risk.
- The SMT for life coverage
 - There is no problem in terms of conservativeness.
 - But mortality experience is expected to continuously improve for a short and middle term.

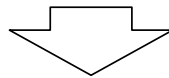


The IAJ revised both tables.



2.3 Development of a different SMT

- Third-Sector products (medical insurance etc.) have become popular in Japan.
- The FSA required that insurance companies calculate reserves of third-sector products by using the mortality, which takes into account:
 - The characteristics of insured group
 - The longevity risk



The IAJ developed a different SMT to apply to third-sector products.

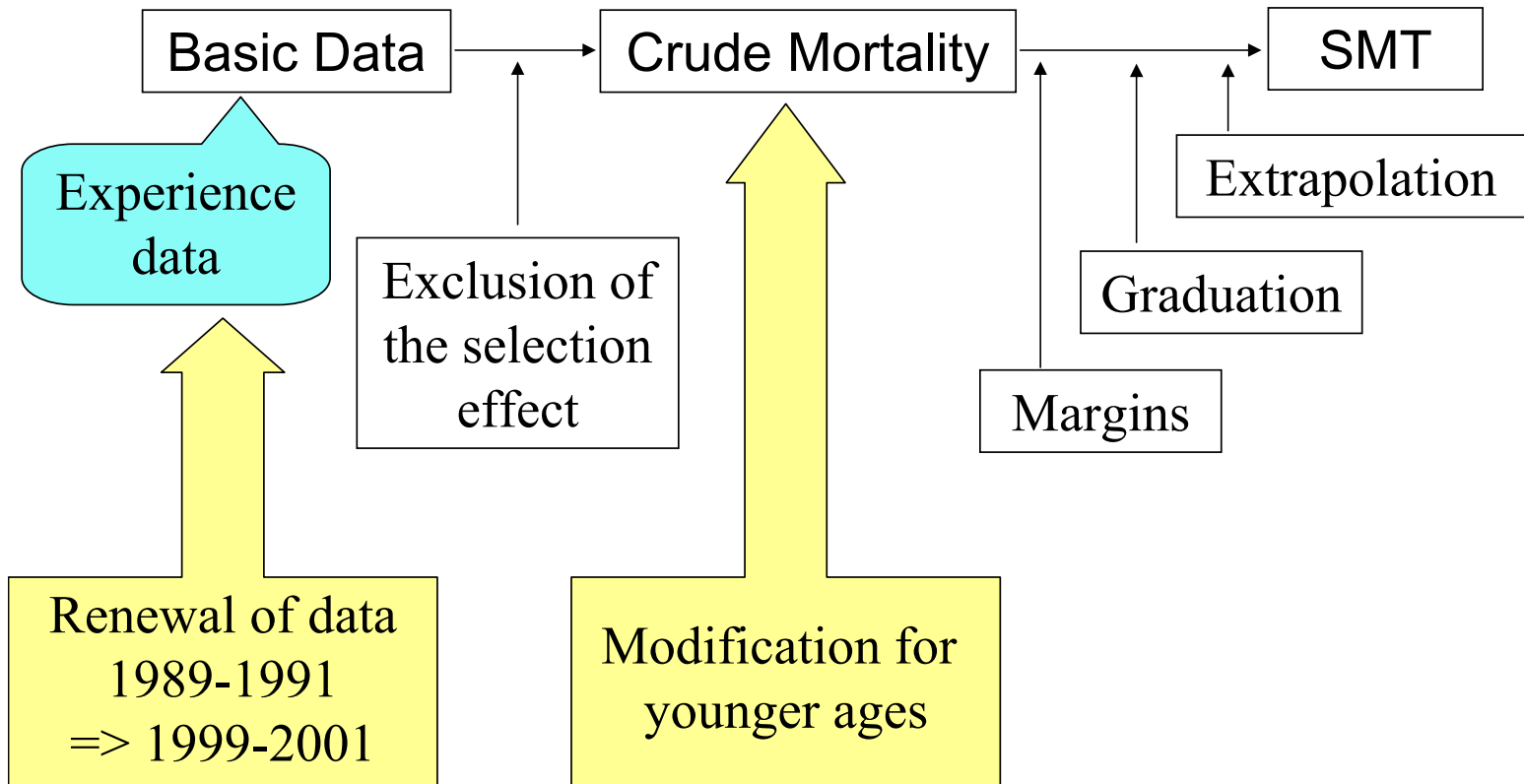


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Differences from 1996

3.1.1 Flowchart





3.1.2 Determination of the crude mortality

- Basically, the experience data of medical standard issues, male and female, with policy years not longer than 30 years are used. Difference from 1996
- 1999-2001 are combined to secure **stability**.
- At most 1st-5th policy years are excluded to secure **conservativeness**.
- Since the experience data of younger ages are insufficient, the Abridged Tables are used instead. Difference from 1996



3.1.3 Construction of the SMT

- Since the number of deaths is well-modeled by the binominal distribution, the margins are developed as follows:

$$q_x^{(1)} = q_x^{(0)} + \min(2 \sigma_x, 0.3q_x^{(0)})$$

- The Greville's formula is adopted for graduation, and the Gompertz-Makeham's Law is adopted for extrapolation of the mortality of old ages, which are also used in the population tables.



3.1.4 Key Figures of the SMT 2007 for Life Coverage (Male)

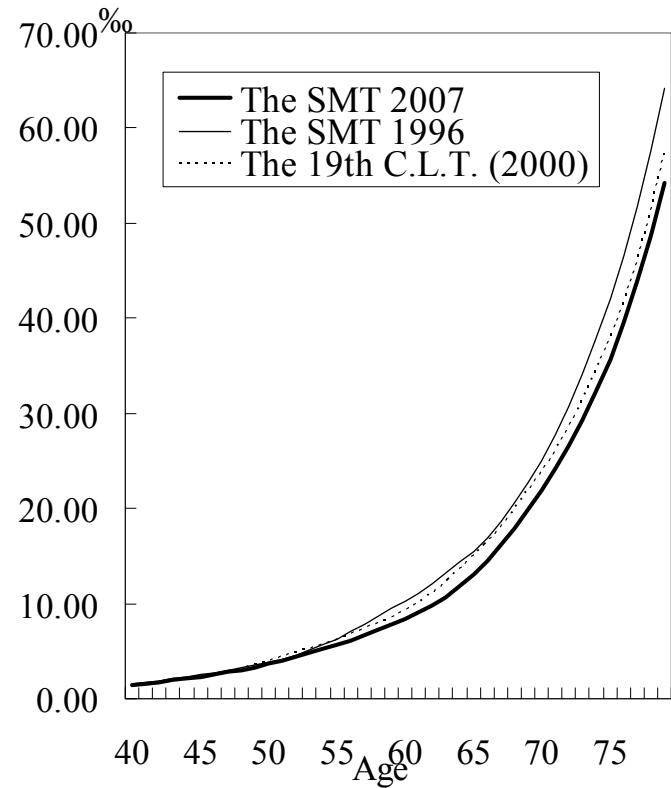
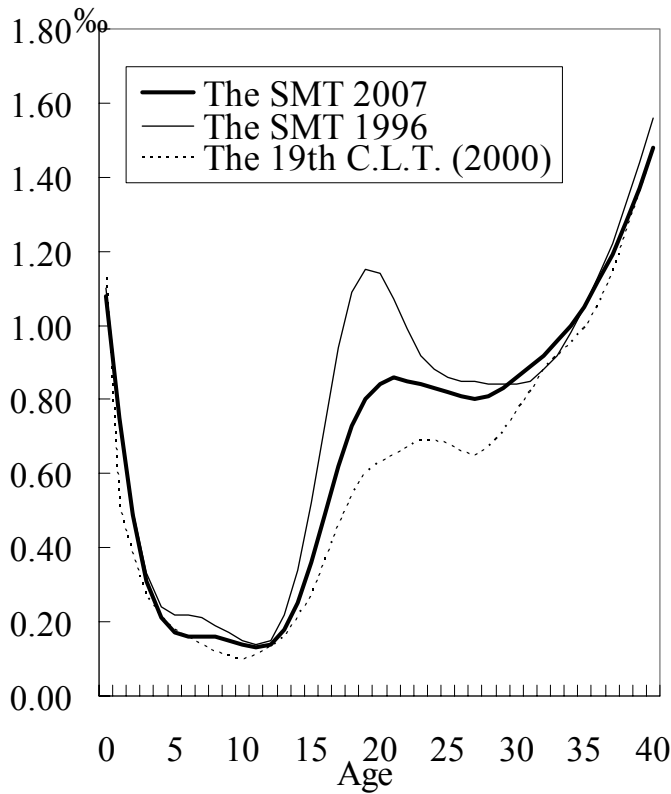
	Age	Male	
		SMT 2007	SMT 1996
Mortality (‰)	30	0.86	0.84
	40	1.48	1.56
	50	3.65	3.79
	60	8.34	10.22
Life Expectancy at Birth (years)		78.24	76.74
Final Age		107	106



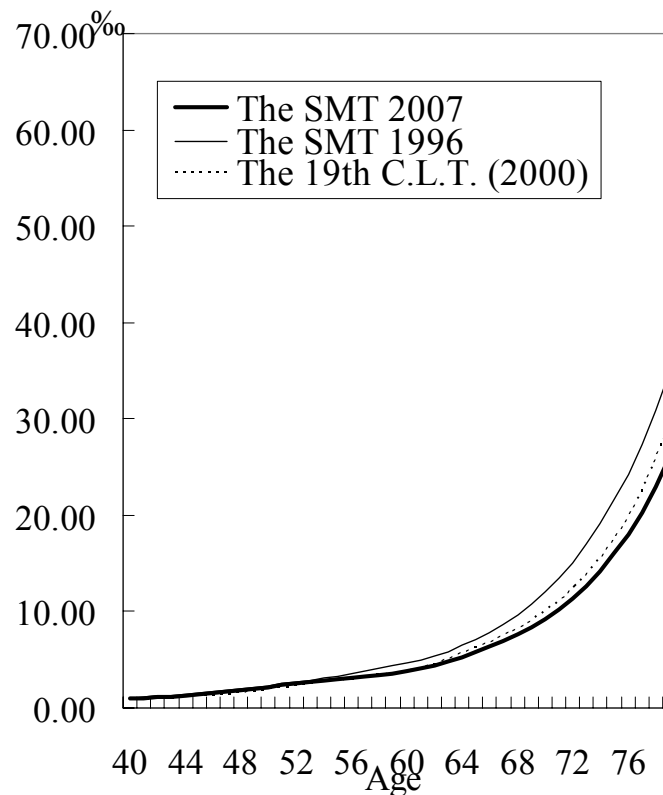
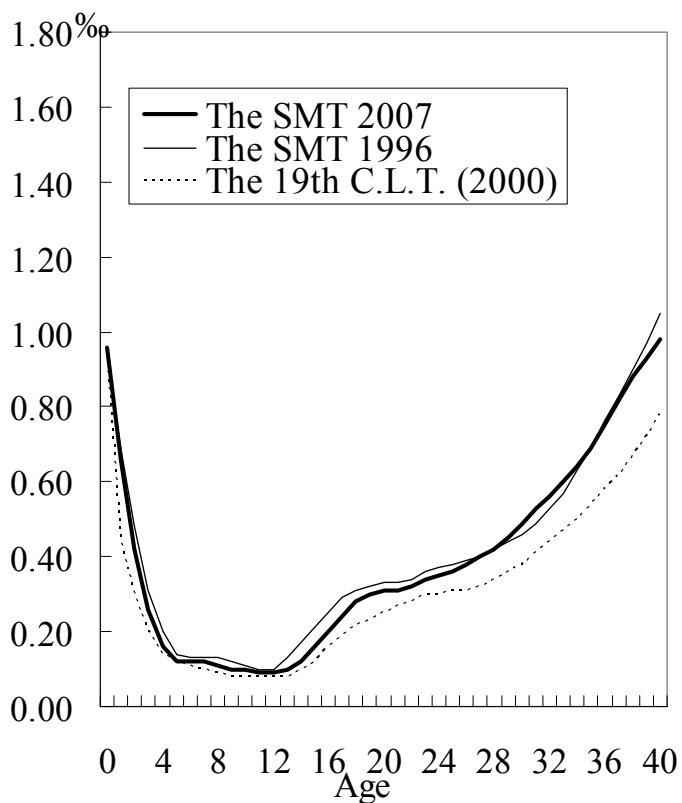
3.1.4 Key Figures of the SMT 2007 for Life Coverage (Female)

	Age	Female	
		SMT 2007	SMT 1996
Mortality (‰)	30	0.49	0.46
	40	0.98	1.05
	50	2.16	2.33
	60	3.79	4.69
Life Expectancy at Birth (years)		84.94	82.94
Final Age		110	109

3.1.5 Figures of the SMT 2007 for Life Coverage (Male)



3.1.5 Figures of the SMT 2007 for Life Coverage (Female)



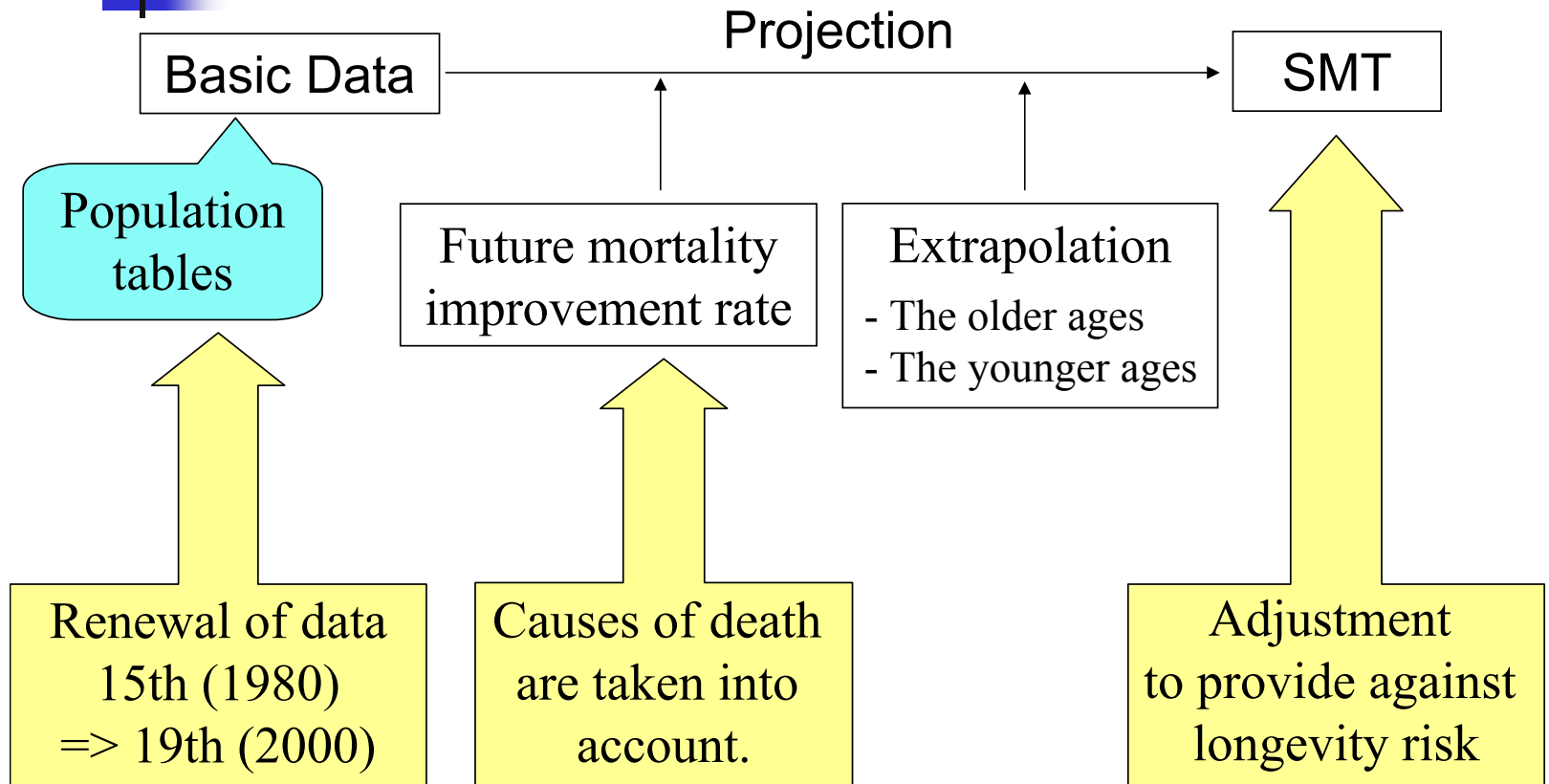


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Differences from 1996

3.2.1 Flowchart





3.2.2 Basic Data / Future Mortality Improvement Rate

- Since the experience data of annuitants are insufficient, the 19th Complete Table (2000) is selected as the base table for the SMT.  Difference from 1996
- Future mortality improvement rates are calculated by using the actual mortality improvement from 1980 through 2000.
- Causes of death are taken into account in addition to gender and age group.  Difference from 1996



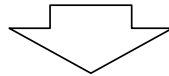
3.2.3 Projection Period

- It is assumed that all at age x in the SMT 2007 were born in 1960.

Age in the SMT 2007	Age in the year 2000	Projection years
50	$2000-1960=40$	$50-40=10 \Rightarrow 20$
60	$2000-1960=40$	$60-40=20$
70	$2000-1960=40$	$70-40=30$
80	$2000-1960=40$	$80-40=40$

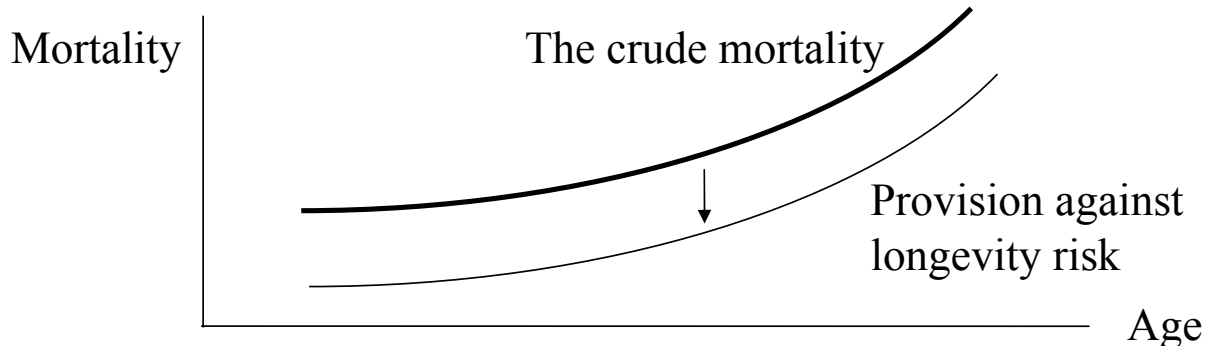
3.2.4 Adjustment to Provide against Longevity Risk

- In order to make a provision against the uncertainty of the future mortality improvement,



A multiple factor of 85% is applied to the mortality for each age.

Difference from 1996



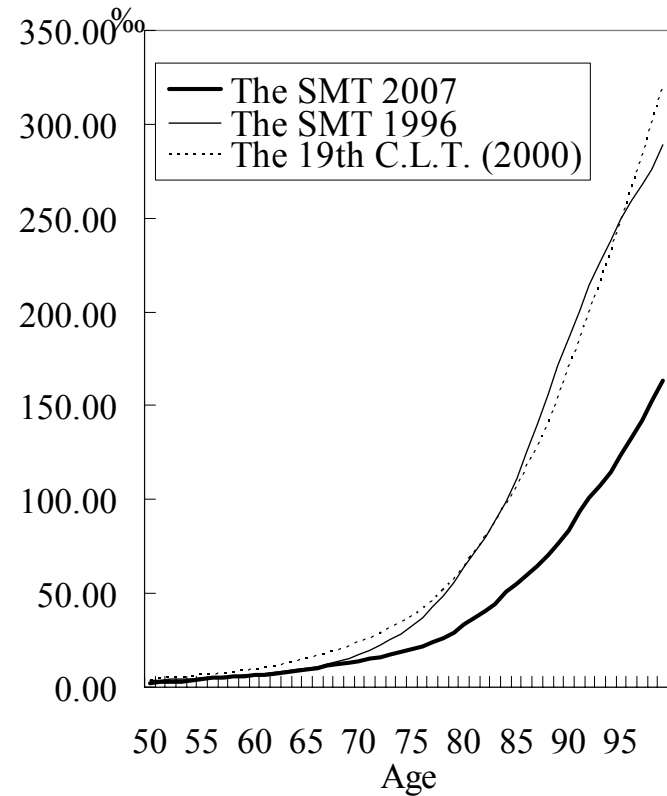
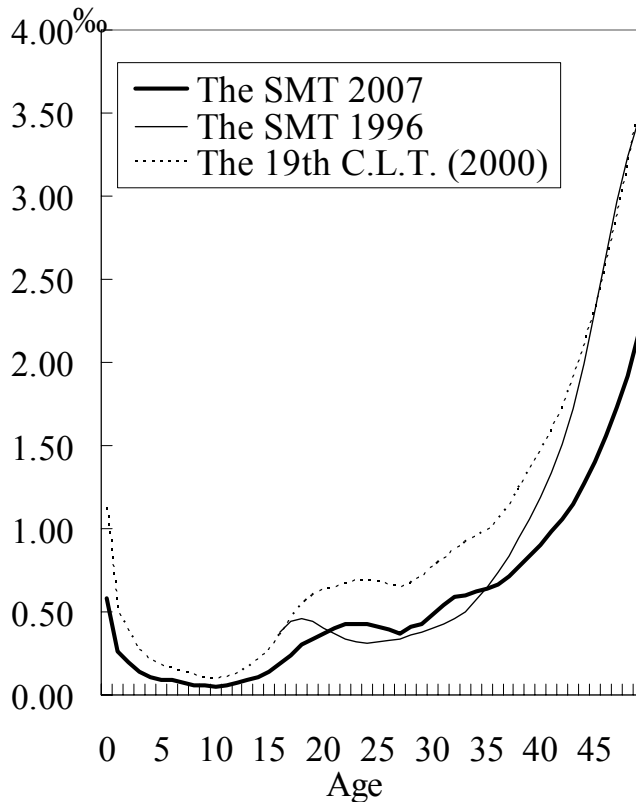
3.2.5 Key Figures of the SMT 2007 for Annuitants (Male)

	Age	Male		
		SMT 2007	SMT 1996	19th Table
Mortality (‰)	60	6.42	6.75	9.23
	70	14.11	17.63	23.84
	80	33.57	63.60	64.01
Life Expectancy (years)	60	26.96	22.52	21.44
	70	19.08	14.35	13.97
	80	12.19	7.77	7.96
Final Age		122	113	112

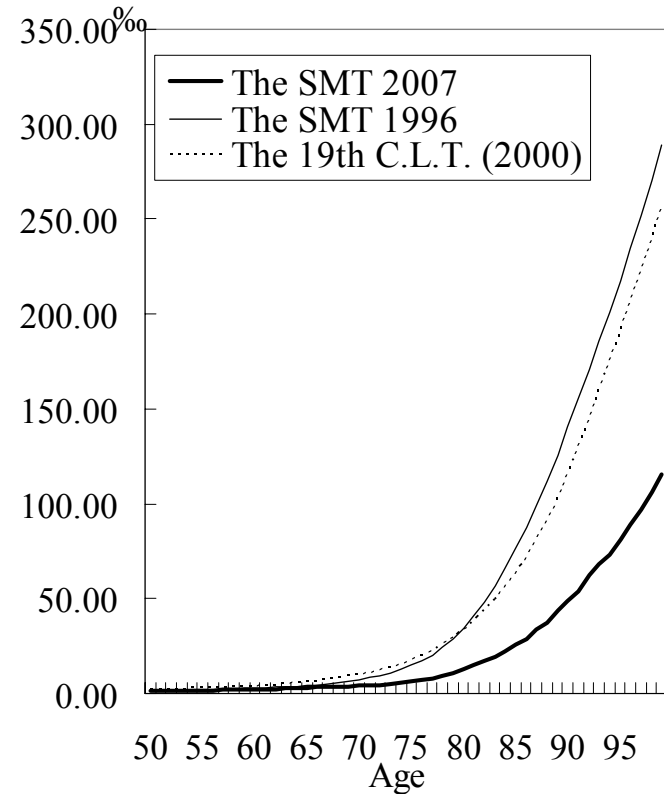
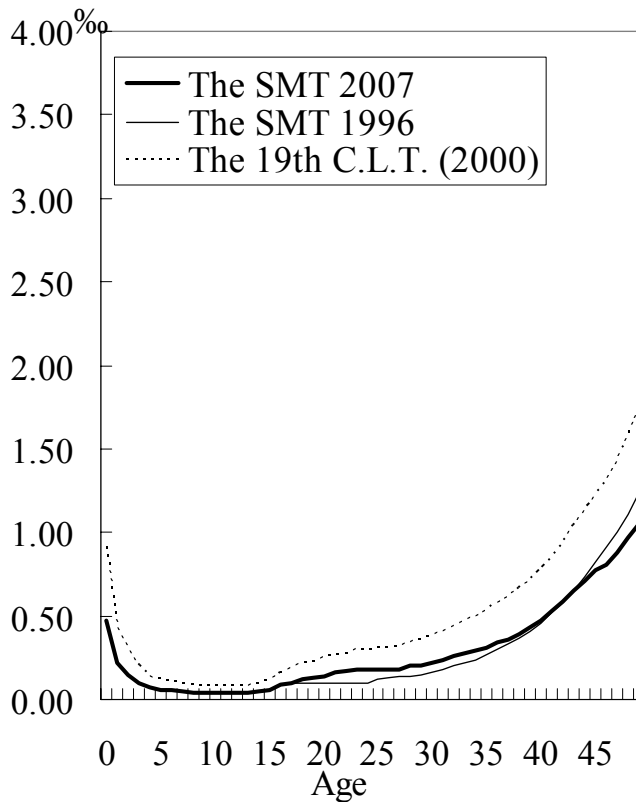
3.2.5 Key Figures of the SMT 2007 for Annuitants (Female)

	Age	Female		
		SMT 2007	SMT 1996	19th Table
Mortality (‰)	60	2.18	2.84	3.83
	70	4.10	7.24	9.99
	80	12.75	34.58	33.65
Life Expectancy (years)	60	34.27	26.85	26.85
	70	25.13	17.76	18.19
	80	16.44	9.73	10.60
Final Age		126	114	116

3.2.6 Figures of the SMT 2007 for Annuitants (Male)



3.2.6 Figures of the SMT 2007 for Annuitants (Female)



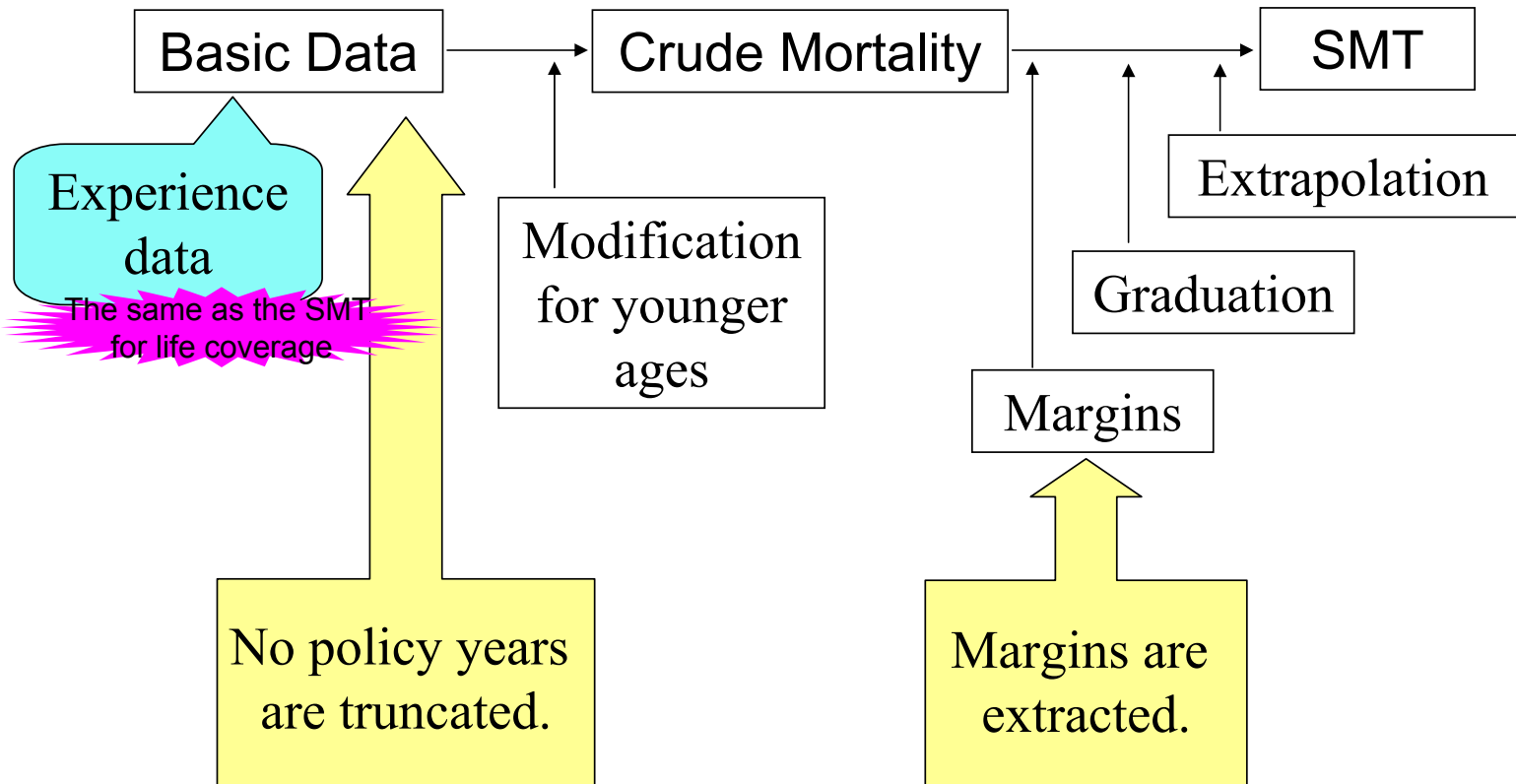


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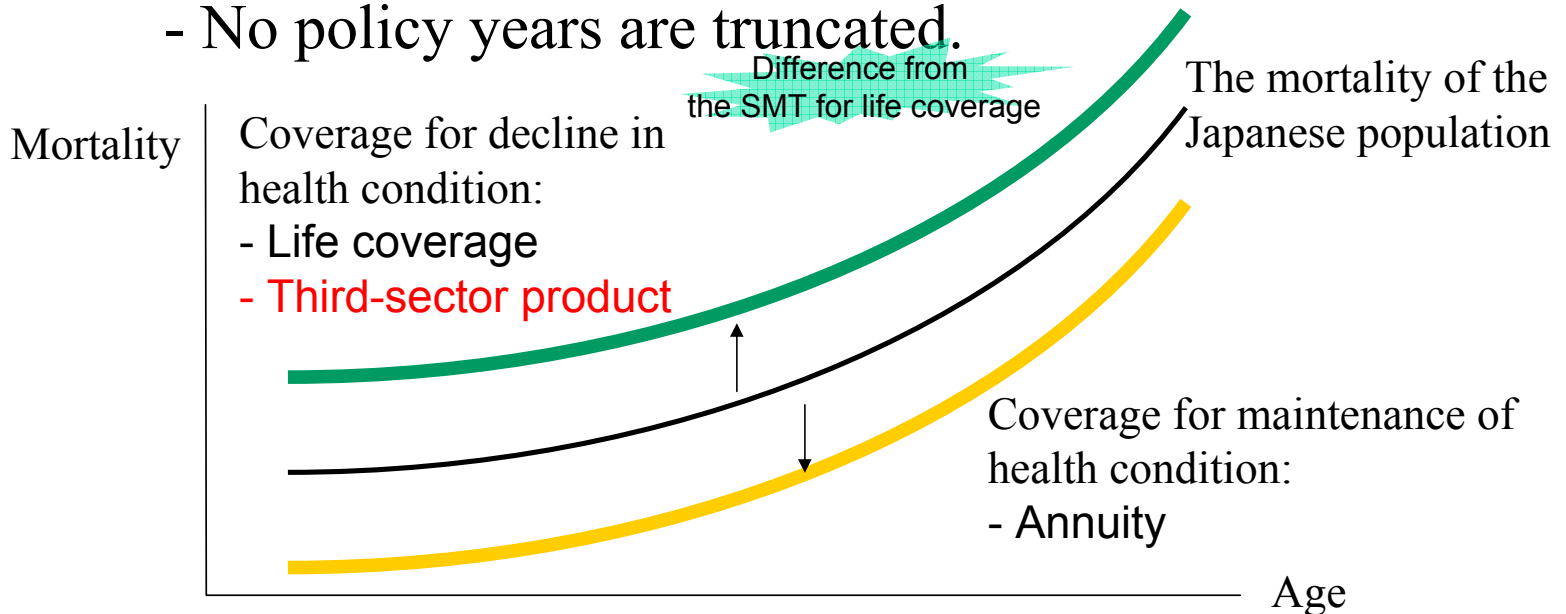
Differences from
the SMT for life coverage

3.3.1 Flowchart



3.3.2 Basic Data

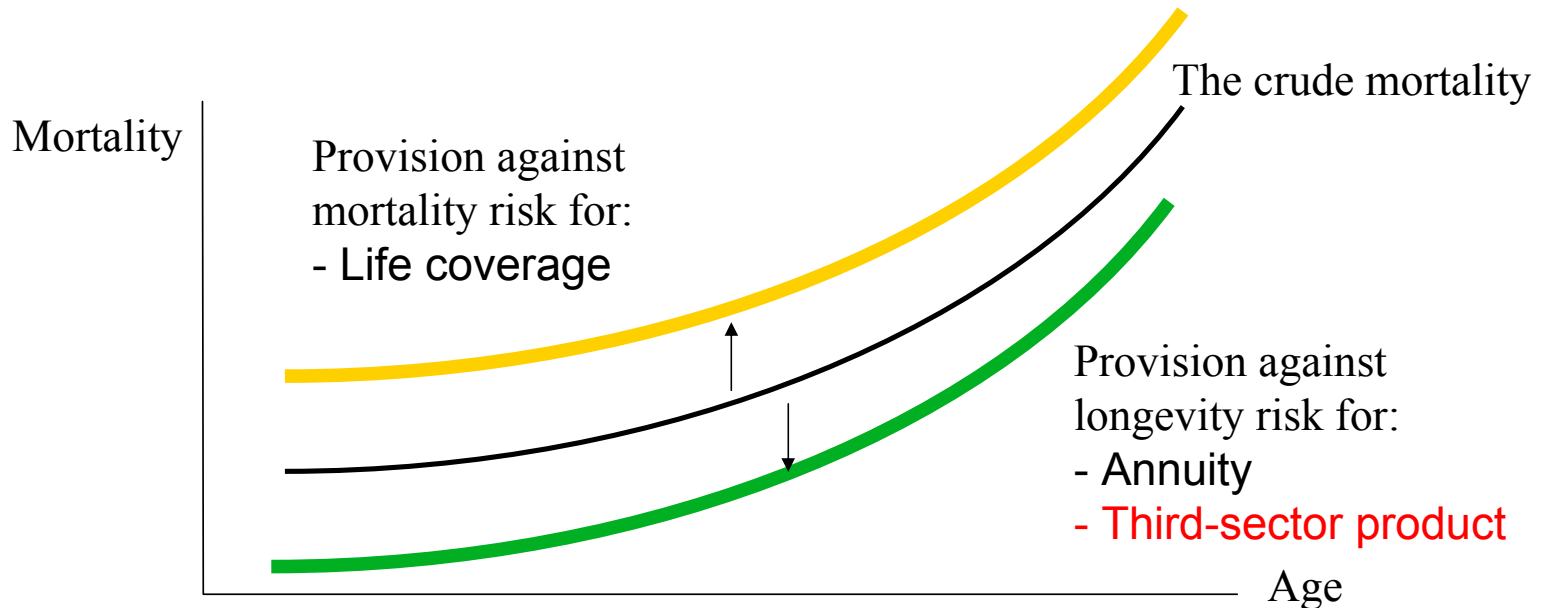
- The same experience data as the SMT 2007 for life coverage is used, except for:
 - No policy years are truncated.



3.3.3 Development of Margins

- Margins are extracted. Difference from the SMT for life coverage

$$q_x^{(1)} = q_x^{(0)} - \min(2 \sigma_x, 0.3q_x^{(0)})$$



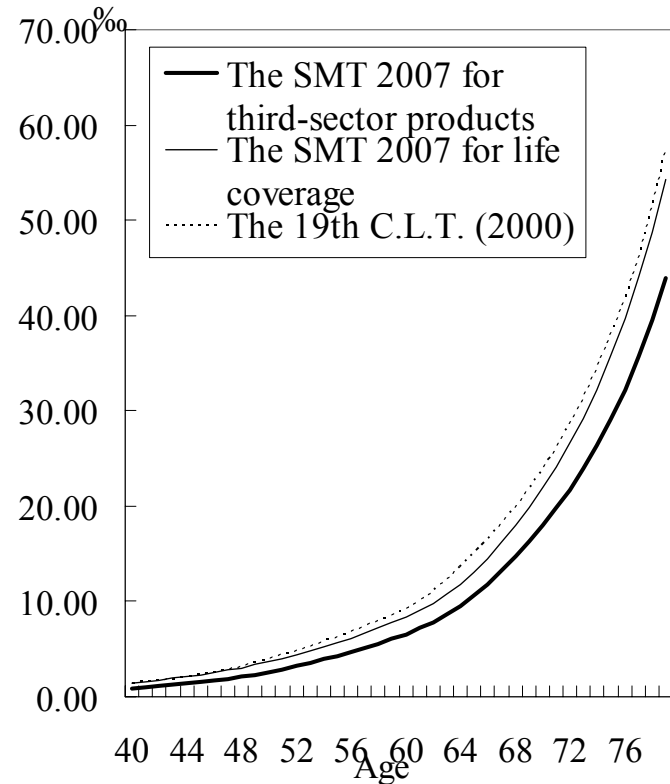
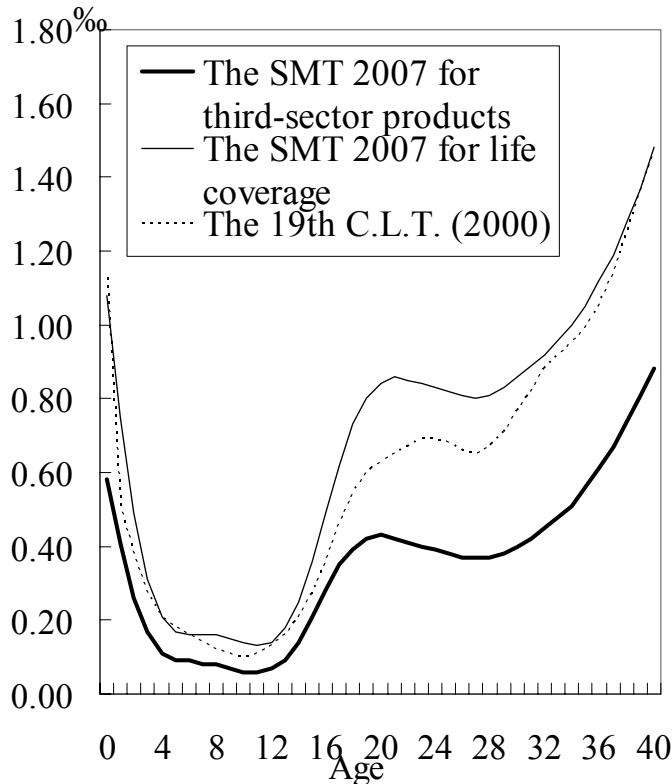
3.3.4 Key Figures of the SMT 2007 for Third-Sector Products (Male)

	Age	Male	
		SMT 2007 for third-sector products	SMT 2007 for life coverage
Mortality (‰)	30	0.40	0.86
	40	0.88	1.48
	50	2.59	3.65
	60	6.58	8.34
Life Expectancy at Birth (years)		81.15	78.24
Final Age		109	107

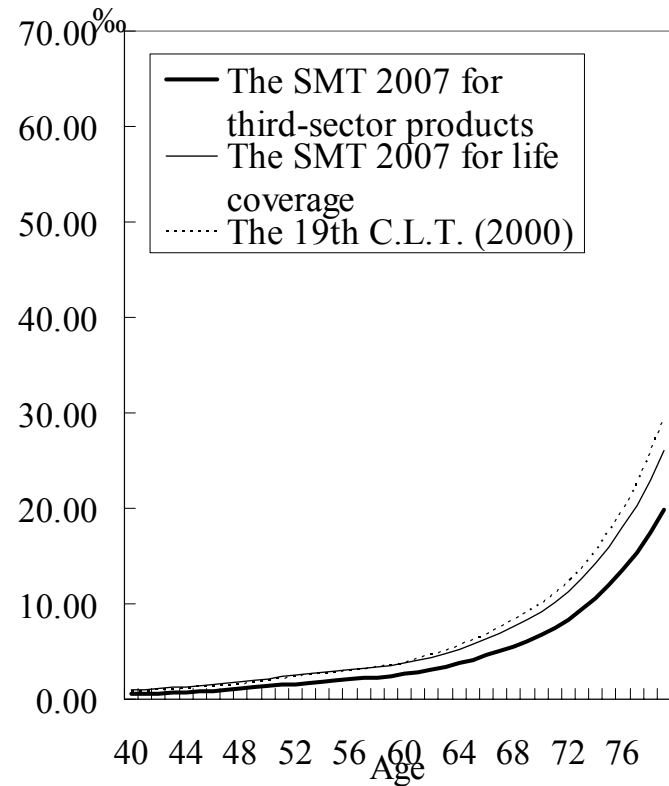
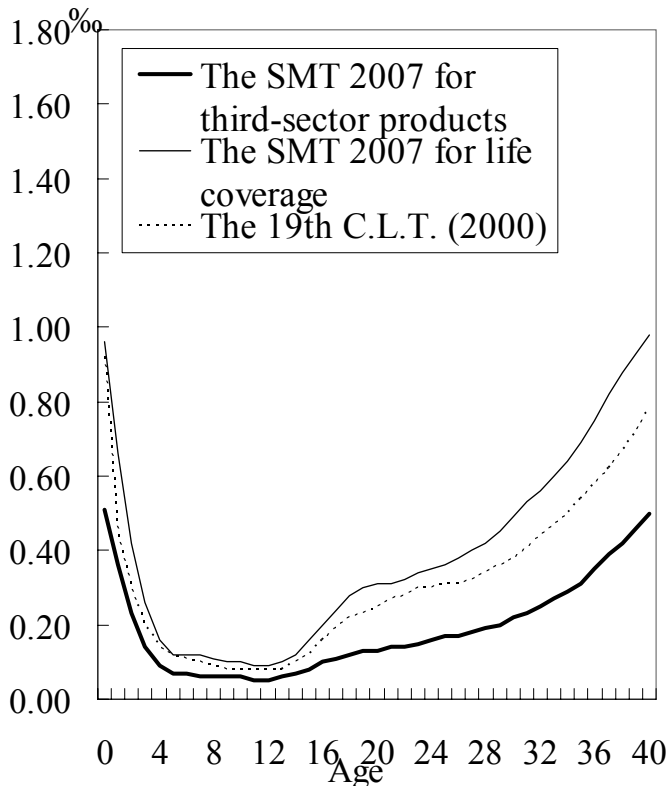
3.3.4 Key Figures of the SMT 2007 for Third-Sector Products (Female)

	Age	Female	
		SMT 2007 for third-sector products	SMT 2007 for life coverage
Mortality (‰)	30	0.22	0.49
	40	0.50	0.98
	50	1.35	2.16
	60	2.64	3.79
Life Expectancy at Birth (years)		87.83	84.94
Final Age		111	110

3.3.5 Figures of the SMT 2007 for Third-Sector Products (Male)



3.3.5 Figures of the SMT 2007 for Third-Sector Products (Female)





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4.1 Arguments about the SMT 2007

- For life coverage
 - The future mortality of the current young and middle ages
- For annuitants
 - Differences among the guarantee types of annuity
 - Selection of projection models
 - Projection of mortality from causes of death
- For third-sector products
 - Collection of mortality experience data



Thank you for listening !

E-mail: tatsuhiro_yamakawa@yahoo.co.jp

