

Longevity
LYON

The eleventh international Longevity Risk
and Capital Markets Solutions Conference

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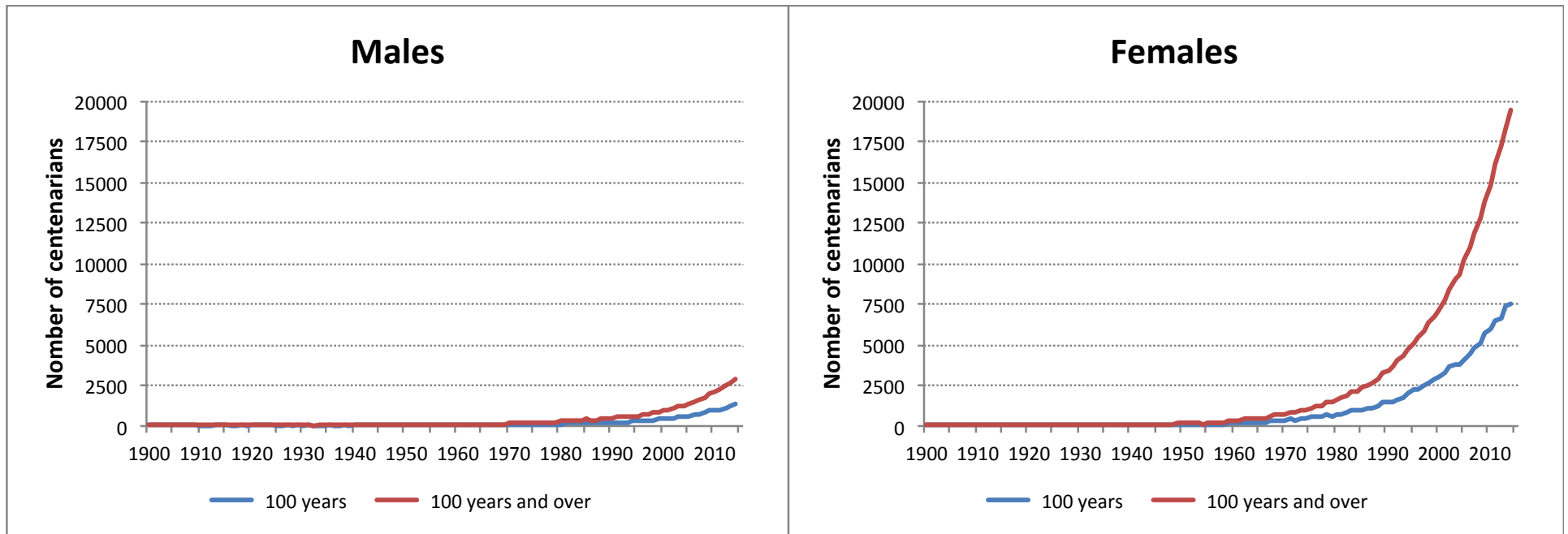
Update on the adult longevity revolution

Jean-Marie Robine

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Dramatic increase in the number of centenarians



French data

A number doubling **on average** every ten years in developed countries

15 000 centenaires en 2010 en France, 200 000 en 2060 ?

Nathalie Blanpain, division Enquêtes et études démographiques, Insee

Au 1^{er} janvier 2010, 15 000 centenaires vivent en France métropolitaine : c'est treize fois plus qu'en 1970. Neuf centenaires sur dix sont des femmes et parmi les personnes de 110 ans et plus, qu'on appelle les « supercentenaires », il n'y a quasiment que des femmes. Un centenaire sur deux vit à domicile, qu'il soit seul, en couple, ou avec une autre personne que son conjoint. La part des centenaires qui vivent en solo ou en couple s'accroît. Les hommes sont plus fréquemment à leur domicile que les femmes.

Dans cinquante ans, la France pourrait compter 200 000 centenaires, soit treize fois plus qu'aujourd'hui. Si les conditions d'espérance de vie sont meilleures que prévu, ils pourraient être 380 000 en 2060, contre 120 000 dans le cas contraire.

doyenne a 114 ans et aucun homme n'a plus de 110 ans.

Treize fois plus de centenaires que dans les années 1970

En 2010, 15 000 centenaires vivent en France métropolitaine (*encadré 1*). Selon le point de vue adopté, on peut considérer que ce chiffre est élevé ou non. C'est beaucoup, car c'est treize fois plus que dans les années 1960-1970. Entre 1960 et 1975, leur nombre était stable, on en comptait 1 150 chaque année. Depuis 1975, leur effectif augmente continûment au rythme de 8 % par an. Au total, ils ne représentent que 0,02 % de la population, ou encore un centenaire pour deux ou trois communes en moyenne, sur les 37 000 que compte la France.

Les « supercentenaires » : quasiment tous des femmes

Selon les travaux de recherches disponibles

INSEE
PREMIERE

Table 2: Number of centenarians in the United

Number of Future Centenarians

December 2010

DWP Department for Work and Pensions

Year	100+	110+
1980	2,300	-
1985	3,400	-
1990	4,400	-
1995	5,700	-
2000	6,800	-
2005	8,900	-
2010	11,800	-
2015	15,000	-
2020	21,900	-
2025	37,600	-
2030	58,800	100
2035	97,300	100
2040	148,900	400
2045	202,100	1,000
2050	276,600	2,100
2055	306,200	3,500
2060	378,200	5,600
2065	487,400	7,200
2066	507,000	7,700
2070	563,500	10,700
2075	587,000	16,200
2080	626,900	21,000

Numbers rounded to nearest 100. Population estimates have to do with 2009, and 2008-based population projections from 2010

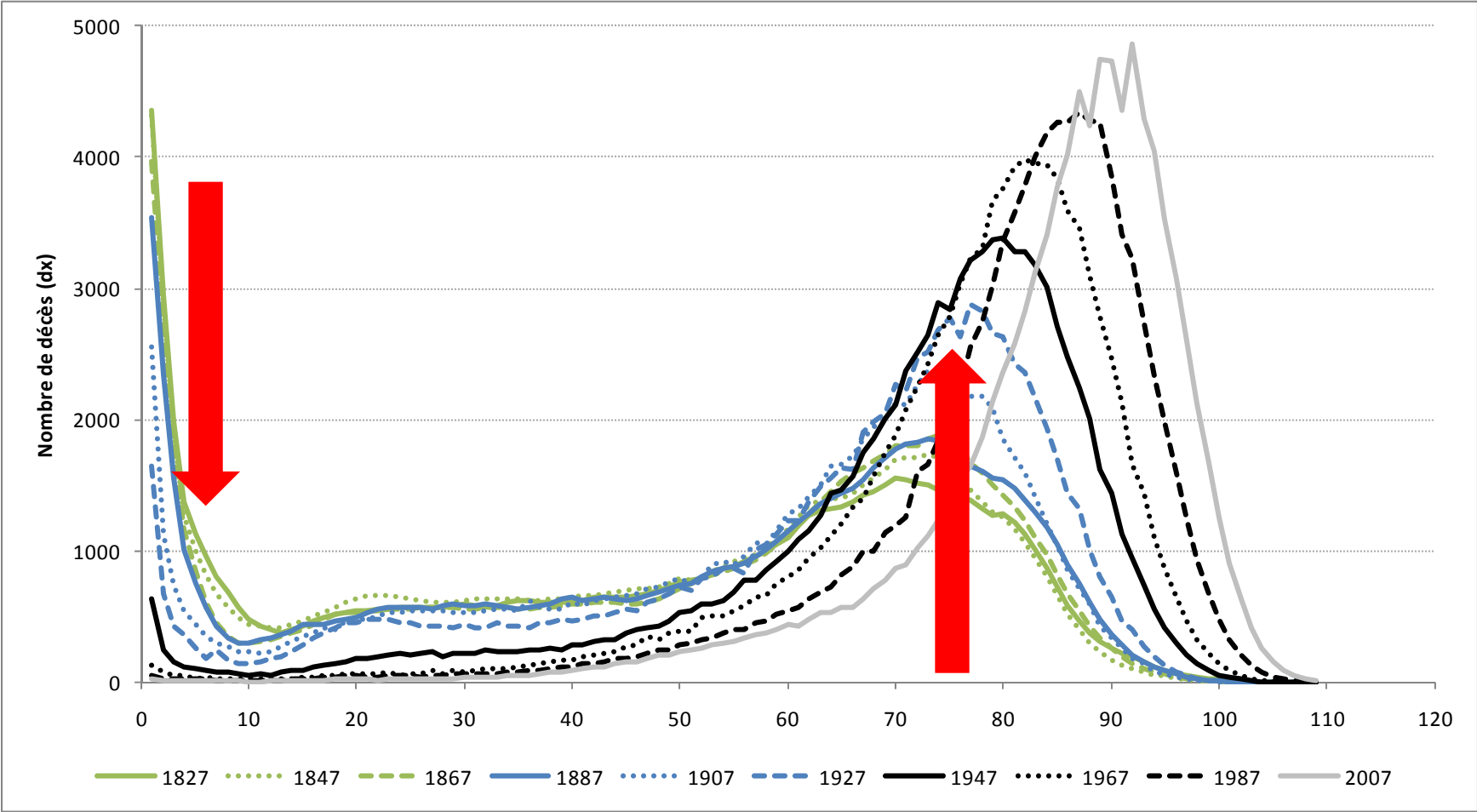
Source: Office for National Statistics, 2008-based Population Projections

Estimates of the very elderly:

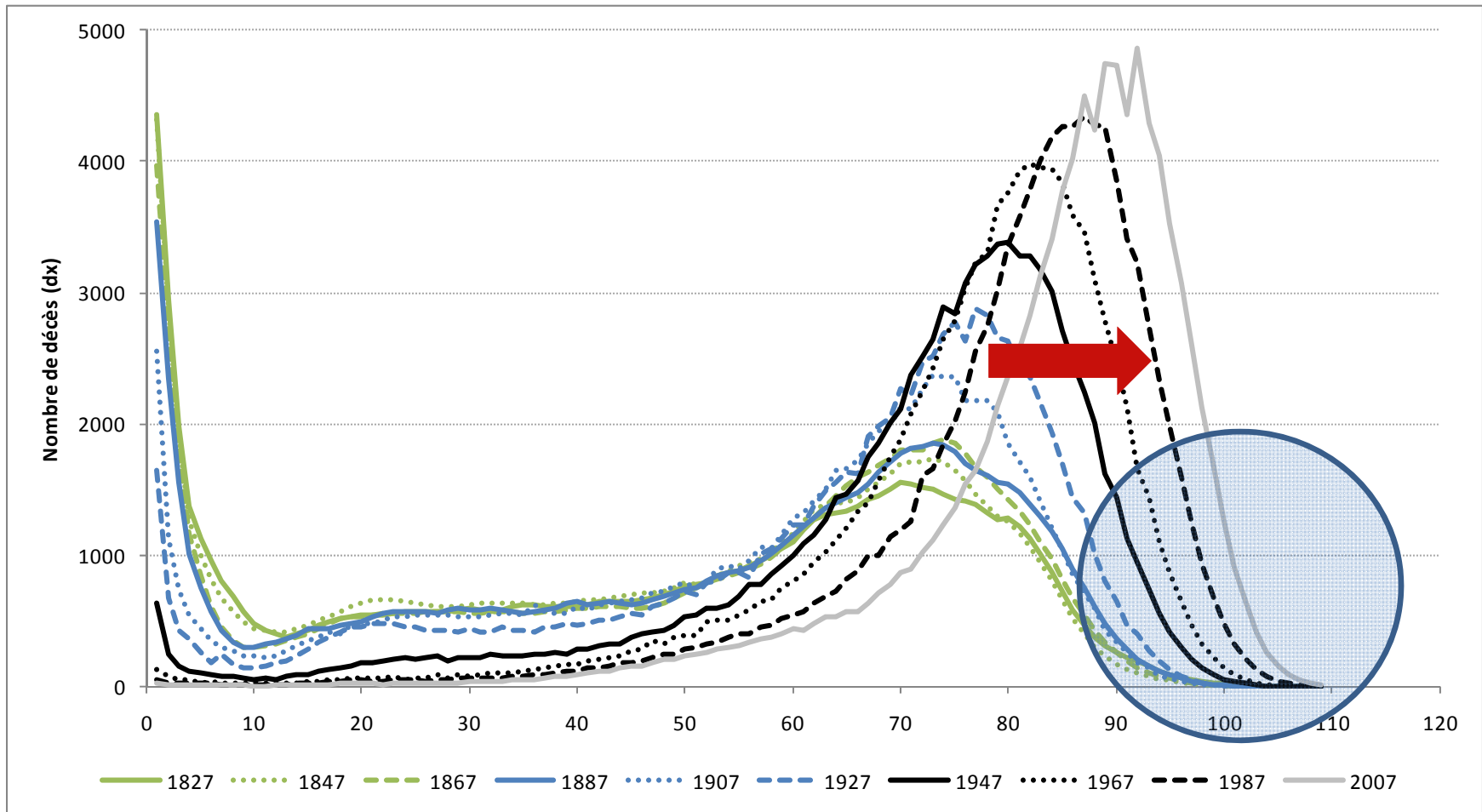
www.statistics.gov.uk/statbase/Product.asp?vlnk=15003

The longevity revolution (dynamics)

Change over time in the distribution of the ages at death in France since 1827, female - for 100.000 newborn



The longevity revolution



Compression vs shifting mortality

SPECIAL ARTICLE

AGING, NATURAL DEATH, AND THE COMPRESSION OF MORBIDITY

JAMES F. FRIES, M.D.

blood pressure are examples of such variables. Exercise, weight control, and diet are some of the common modifying factors.

The modifiability, or "plasticity," of aging has been demonstrated in studies in which performance can be bettered despite age, within surprisingly broad limits. This important phenomenon has been largely unnoticed partly because of an emphasis on average rather than individual performance and partly because disparate disciplines are involved. Average declines in variables in aging can hide remarkable individual variation. The marathon runner is an example (Fig. 4). A runner in middle life who completes a marathon in 3½ hours is in the 99th percentile for this endeavor; yet not until age 73 would that time set an age-group record. These marathon data are important in that they show the maximum rather than the average performance, but here too there is a linear decline in performance between age 30 and 70. Still, the age-related decrement in maximal performance is only 1 per cent per year. Variation between healthy persons of the same age is far greater than the variation due to age; age is a relatively unimportant variable, and training in marathon running is clearly more important than age.



Figure 5. Mortality According to Age, in the Absence of Premature Death.

The morbidity curve is made rectangular, and the period of morbidity compressed between the point of the end of adult vigor and the point of natural death.

Trends in senescent life expectancy

John Bongaarts

Population Council

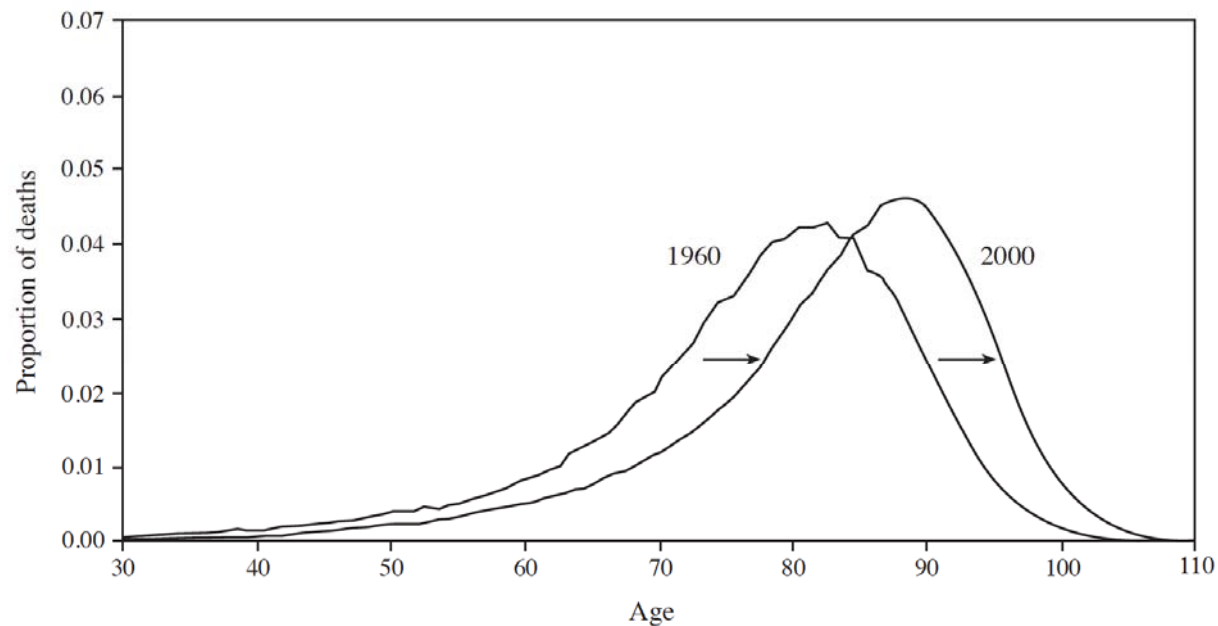


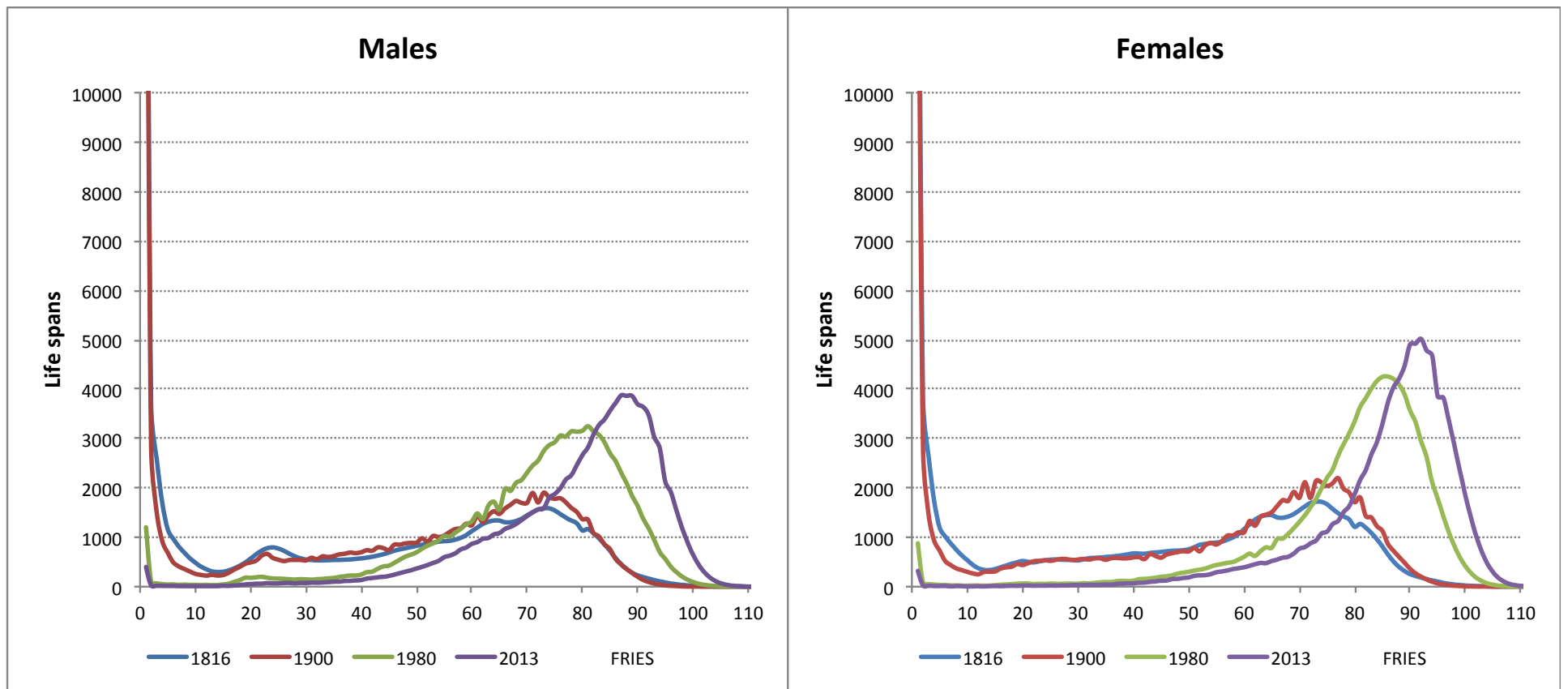
Figure 6 Distribution of senescent deaths by age, Swedish females, 1960 and 2000

Source: As for Figure 4

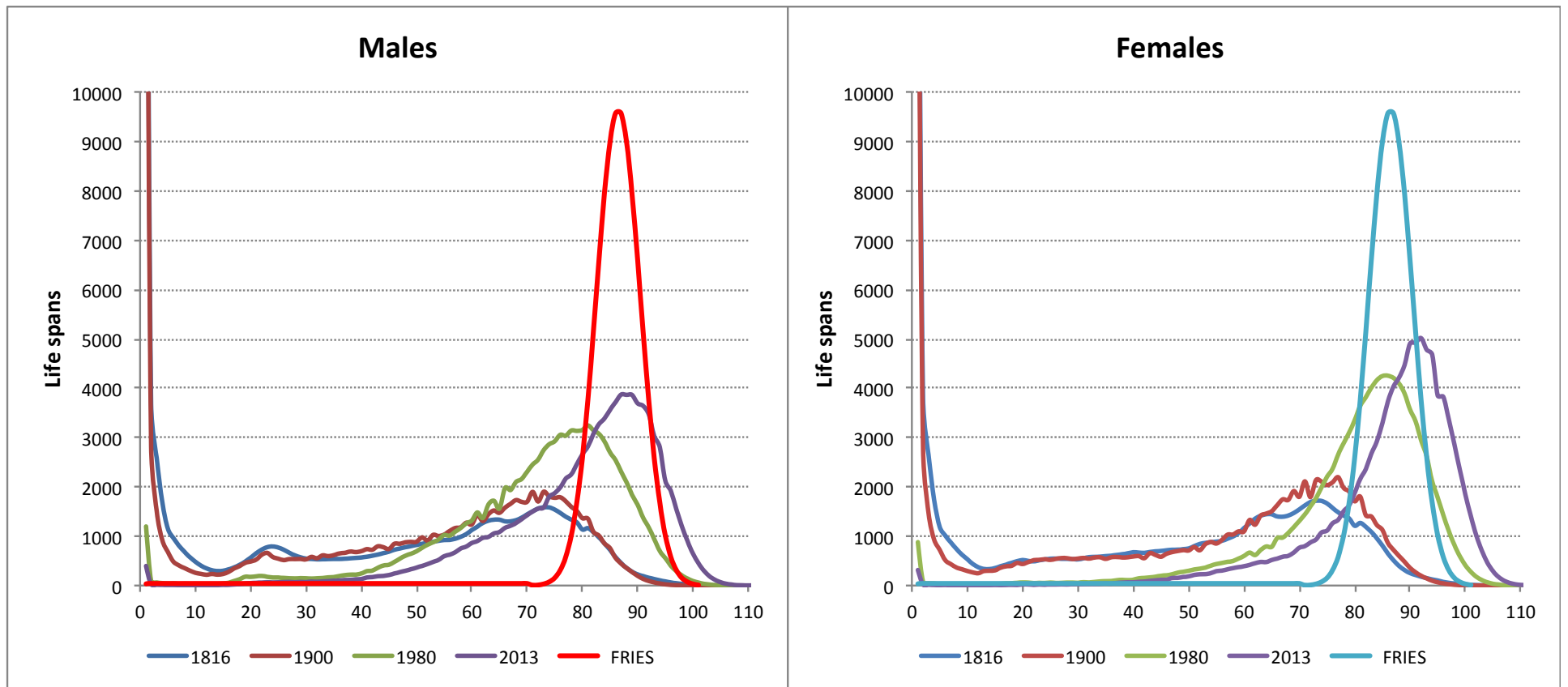
describing
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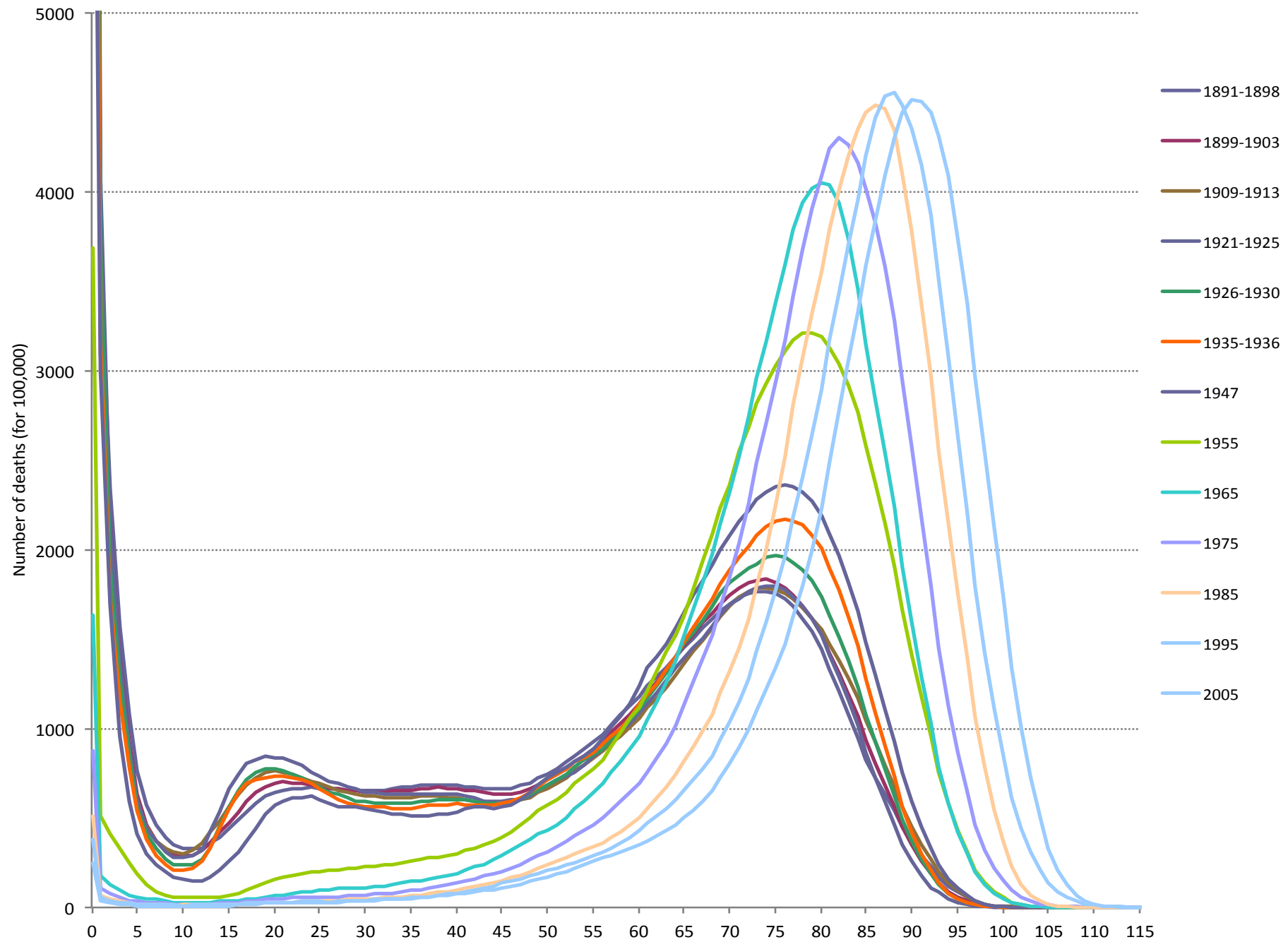
France, empirical observations



France, empirical observations



Japan 1890- 2005, Females



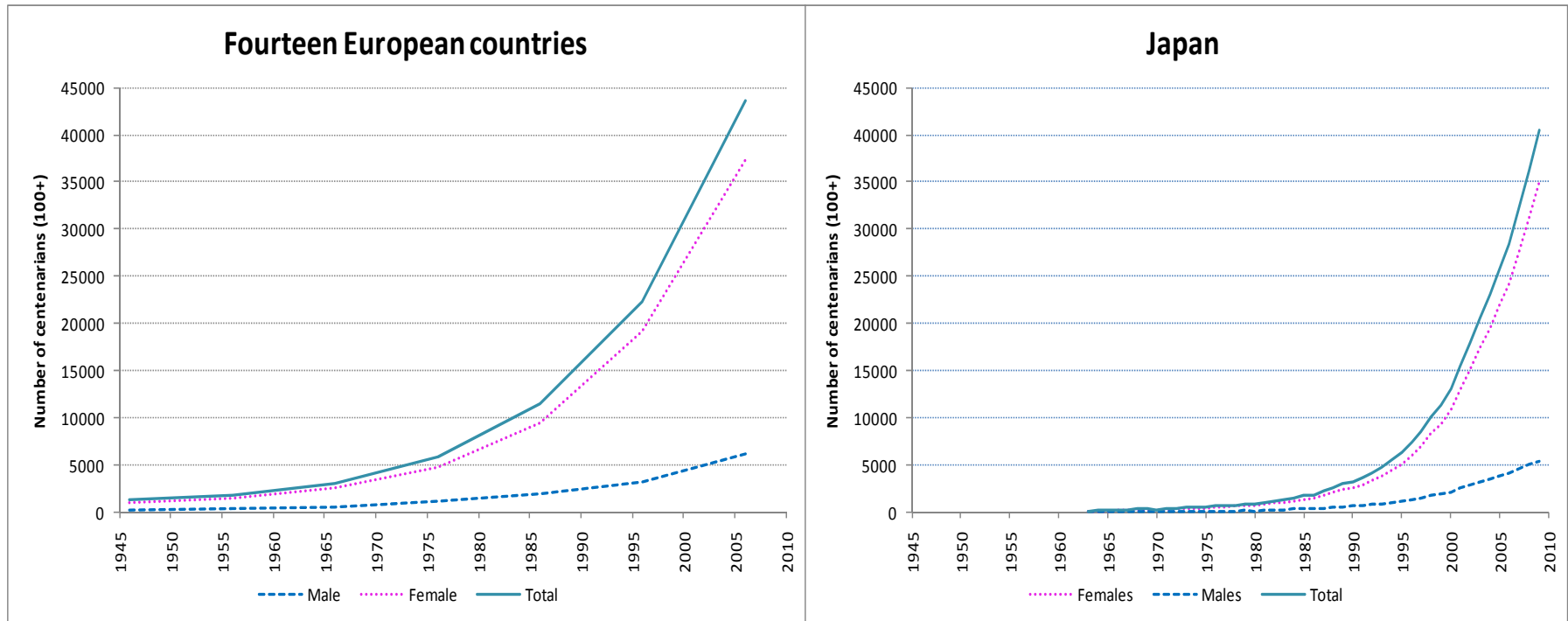
Europe vs. Japan

Table 4: Europe compared with Japan: Number of centenarians in 2006 and various centenarian indicators, by sex

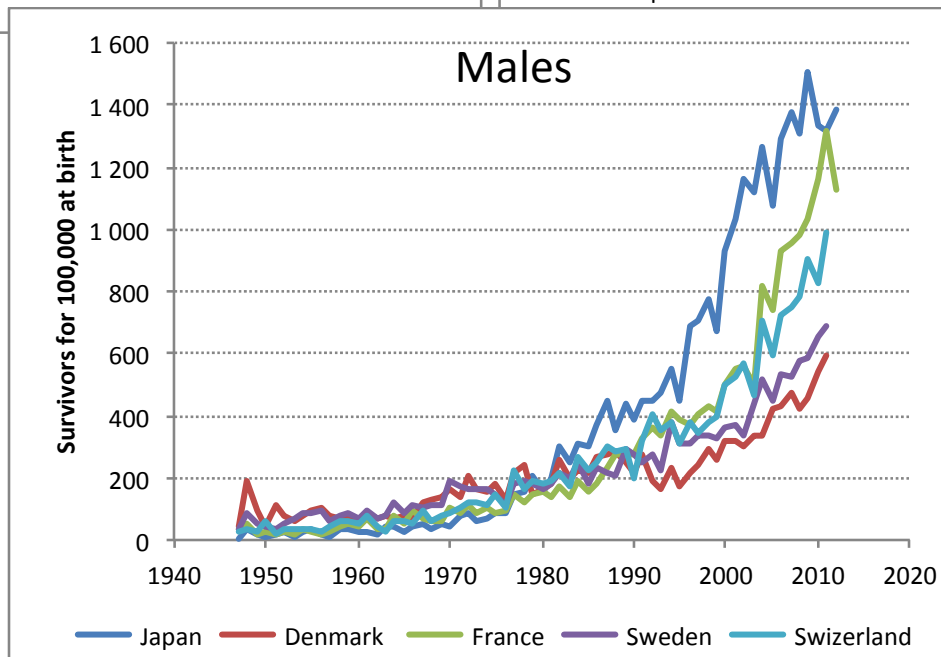
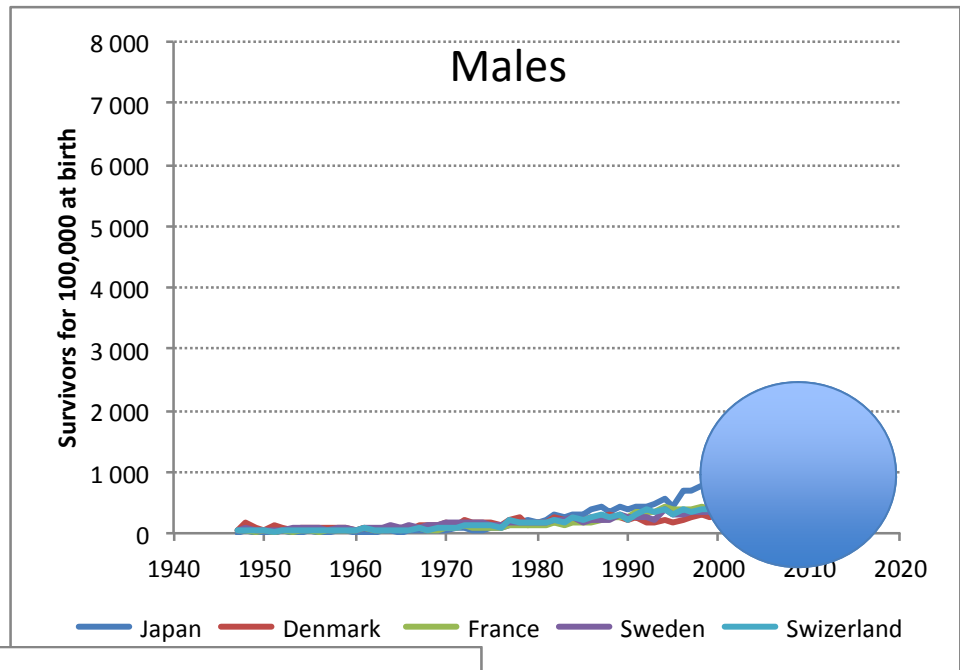
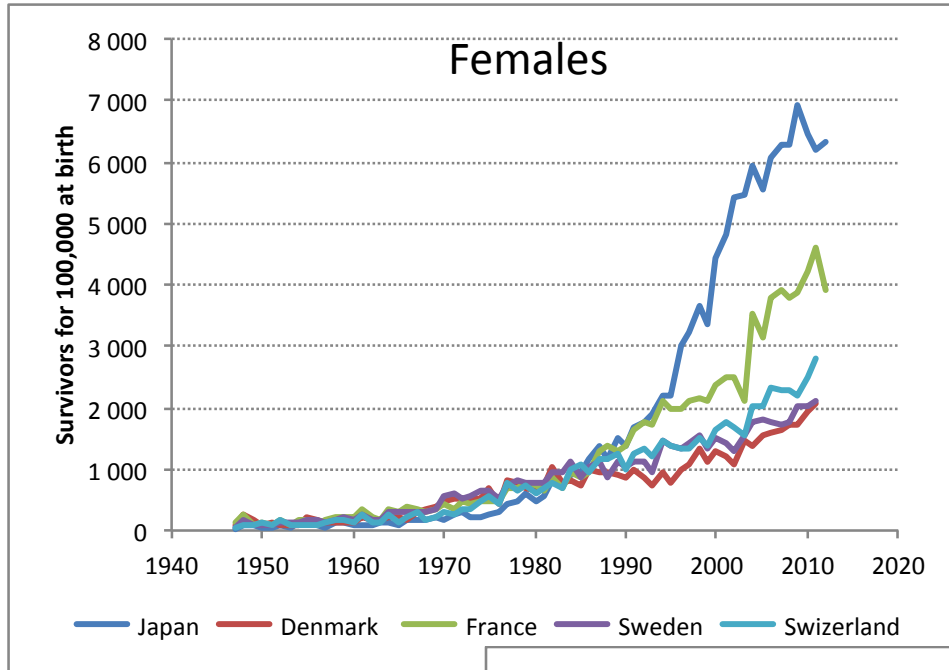
Country	Males	Females	Total	Sex-ratio	Males	Females	Total
	Number of people aged 100 years and more				10-Year Increase		
Japan	3906	23236	27142	5,9	3,0	4,5	4,2
European countries	8228	49078	57306	6,0	2,0	2,0	2,0
	Number of people aged 100 years				Centenarian Rate (CR)*		
Japan	1644	9181	10826	5,6	49,3	259,4	157,5
European countries	3823	20675	24499	5,4	18,5	86,5	55,0

Source of data: Human Mortality Database (HMD); *Slovenia excluded

Increase in the number of centenarians in Europe vs. Japan

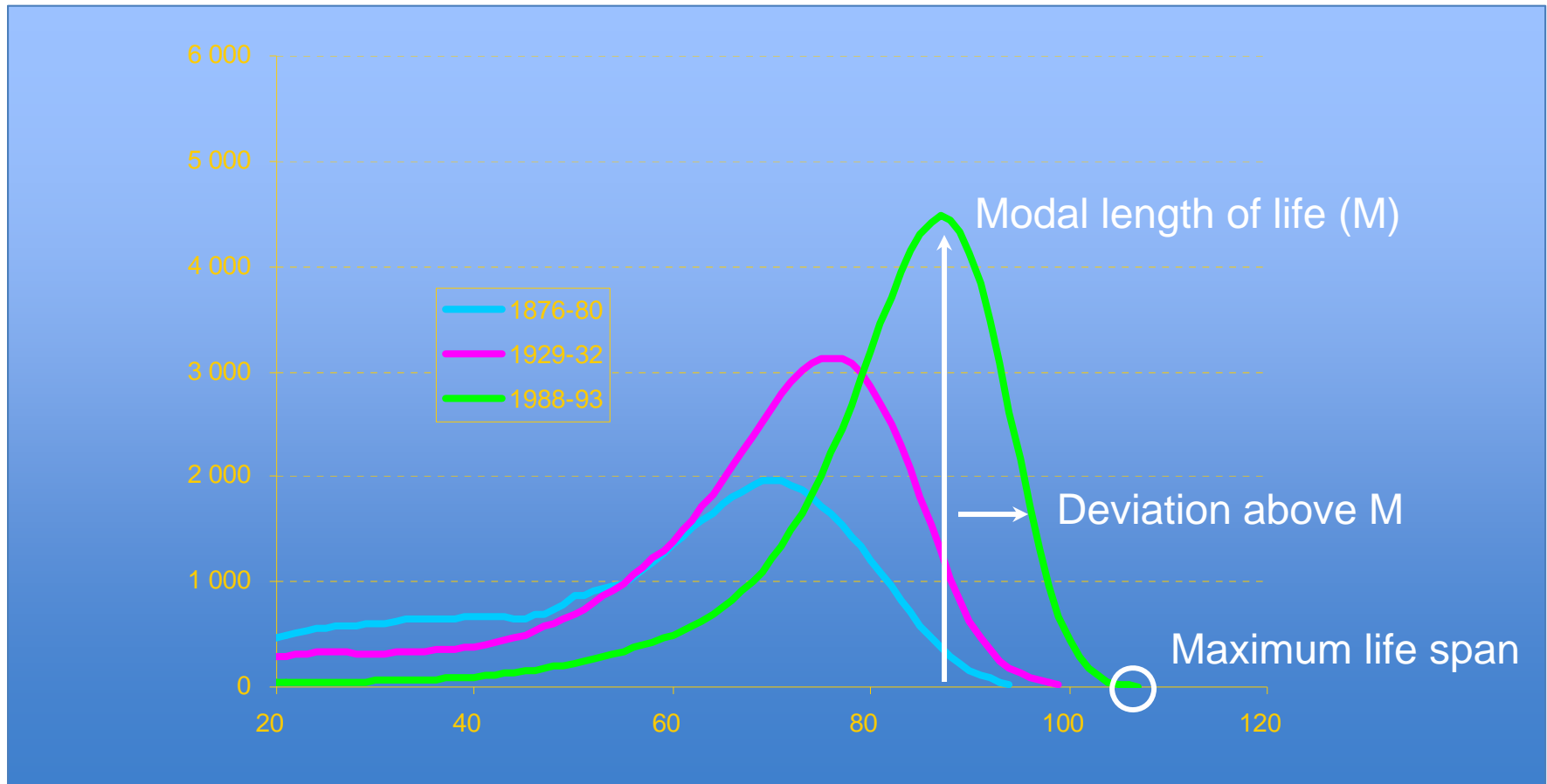


Proportion of people reaching age 100



How long are adult life durations?

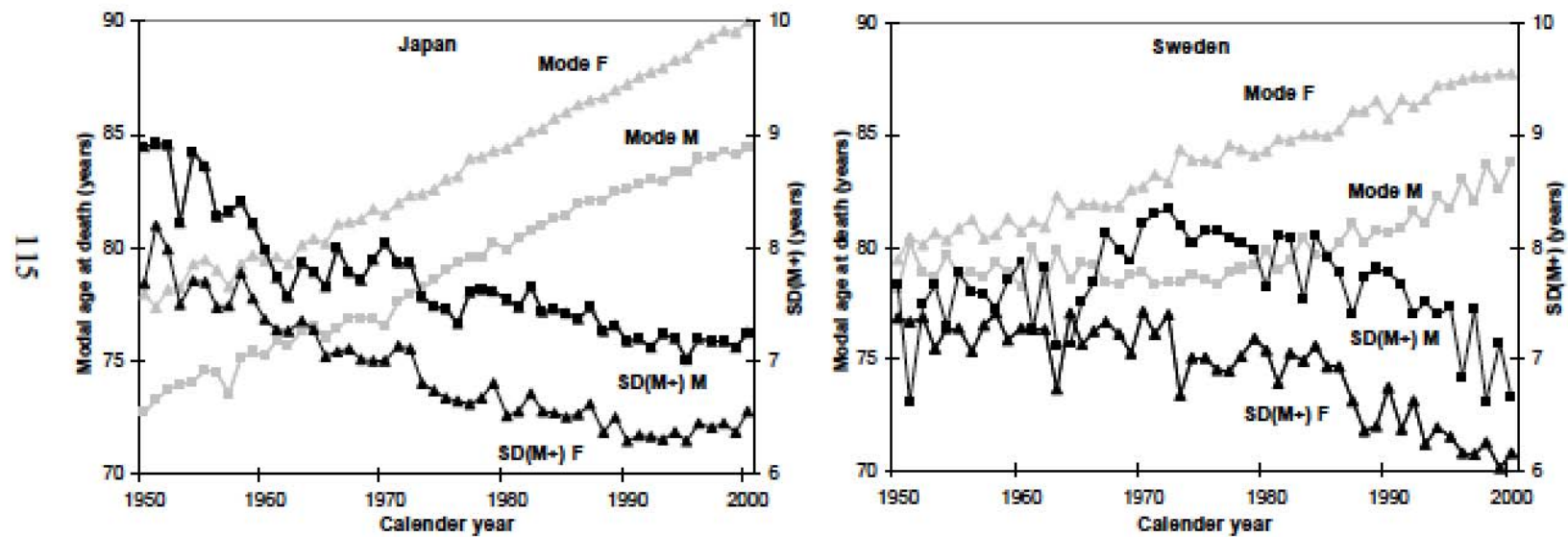
$d(x)$ series



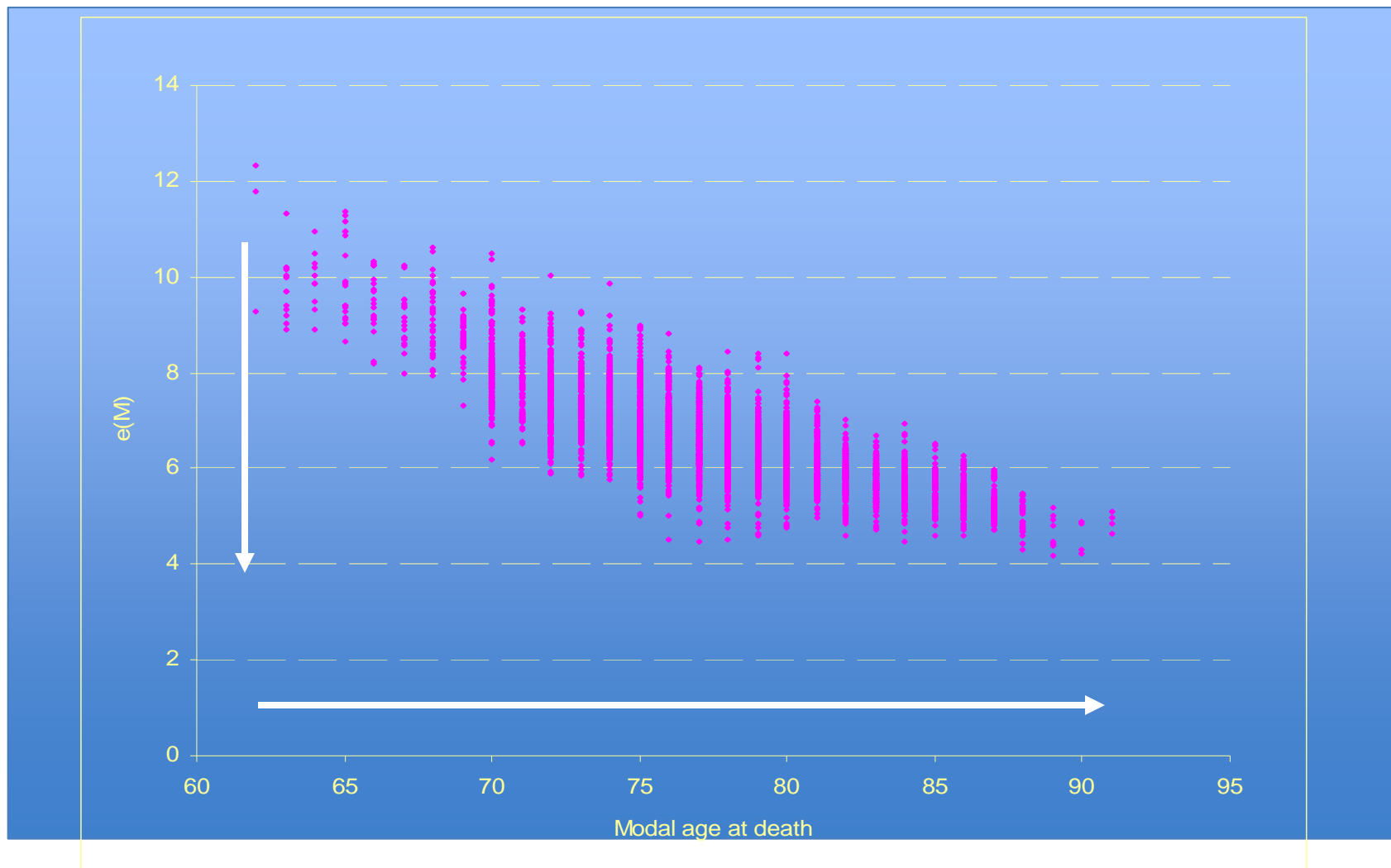
Distribution of the ages at death in Switzerland
1876-1880, 1929-1932, 1988-1993

Japan and Sweden

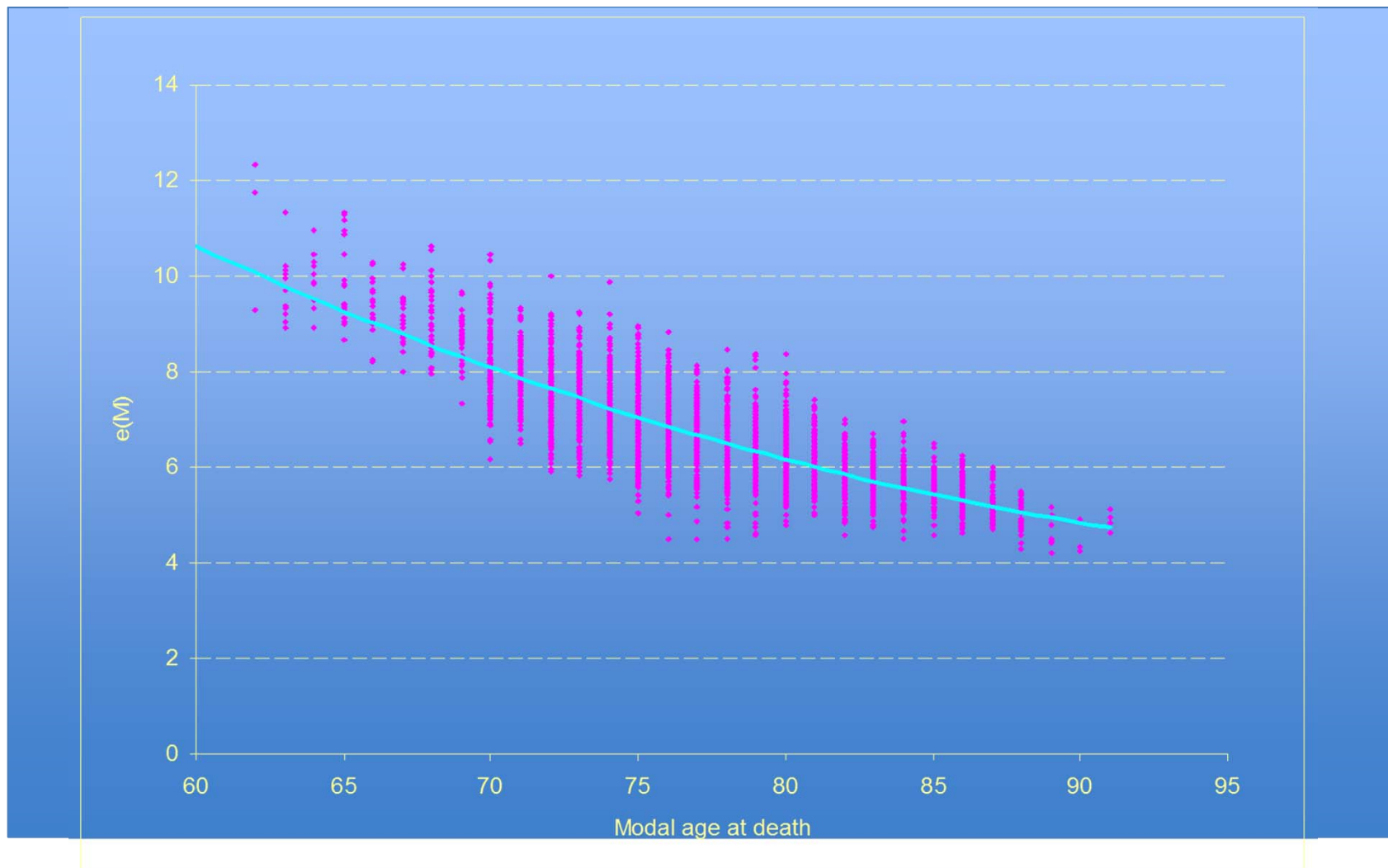
Figure 8 – cont'd



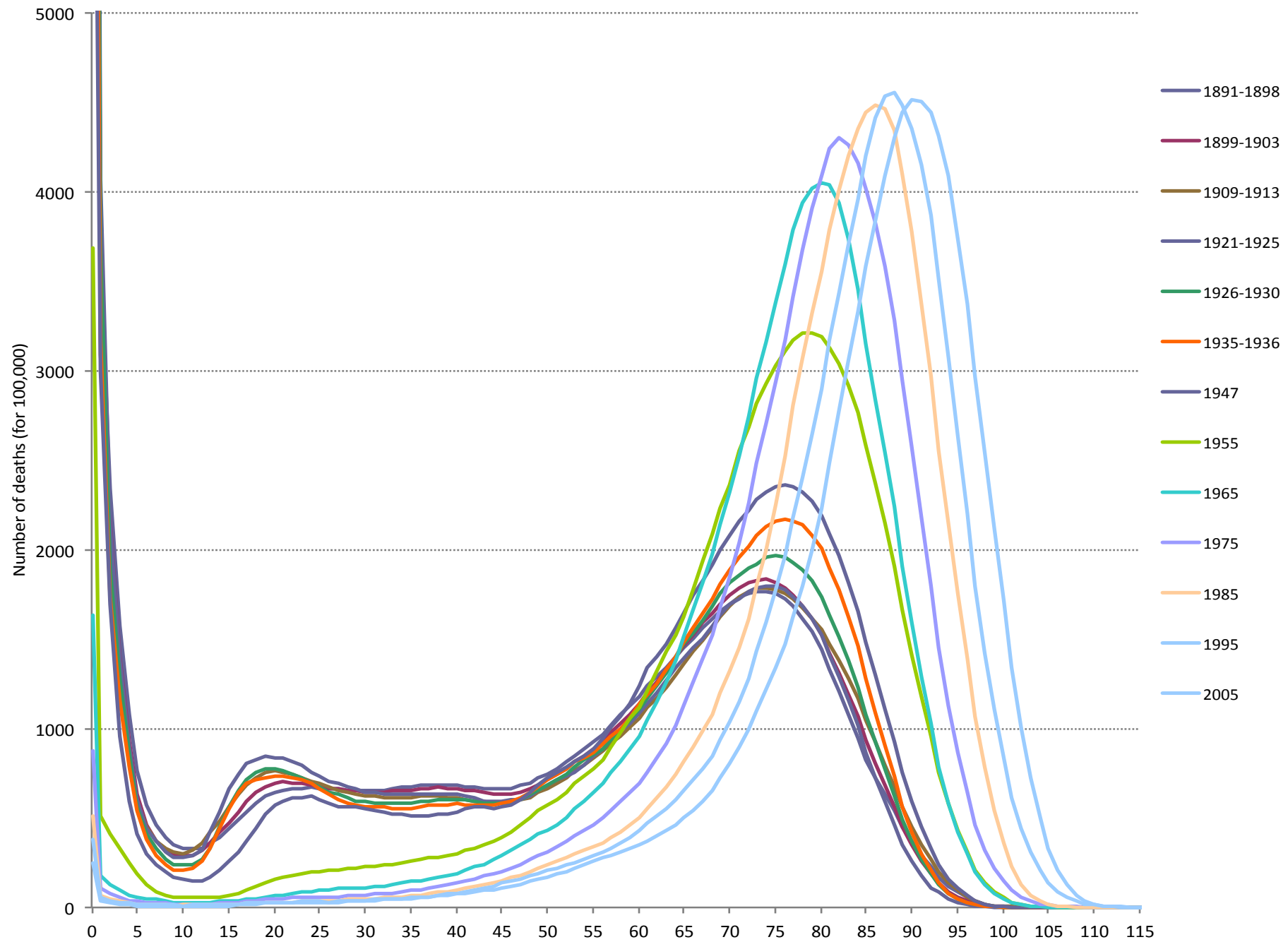
Correlation between the modal length of life (M) and the mean deviation above ($e(M)$) in 4188 life tables since 1751, males and females – (HMD)



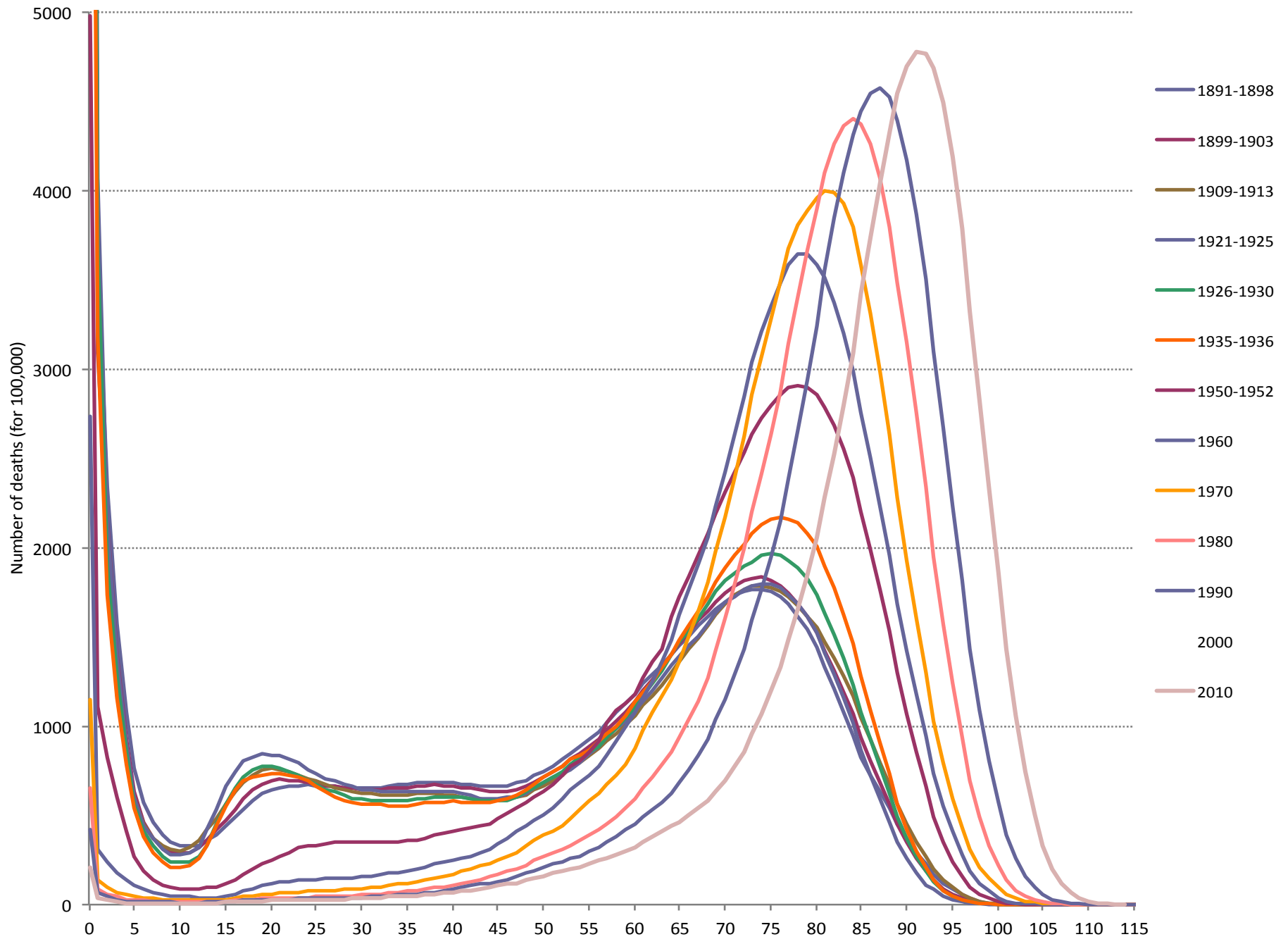
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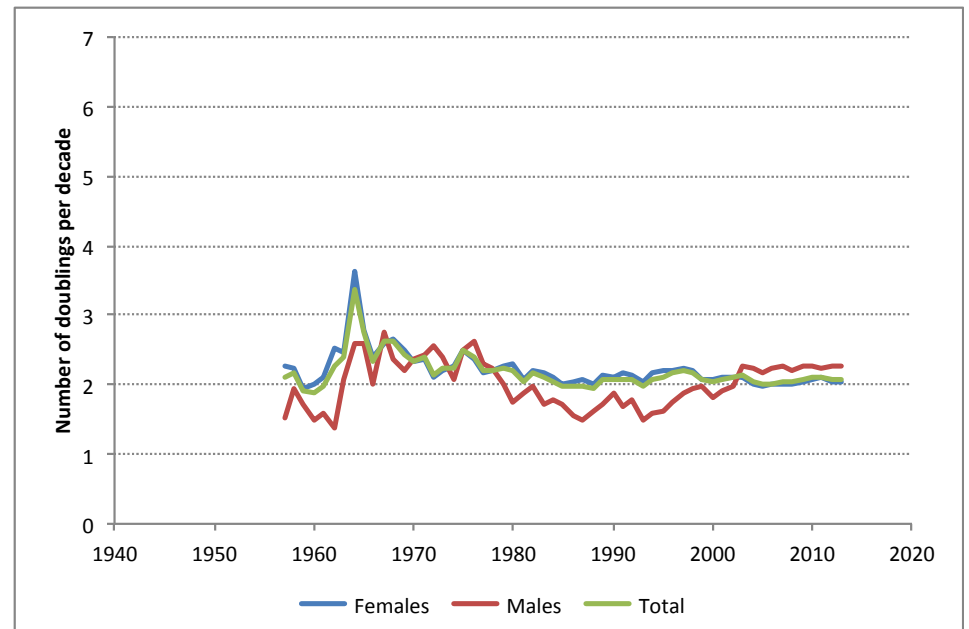
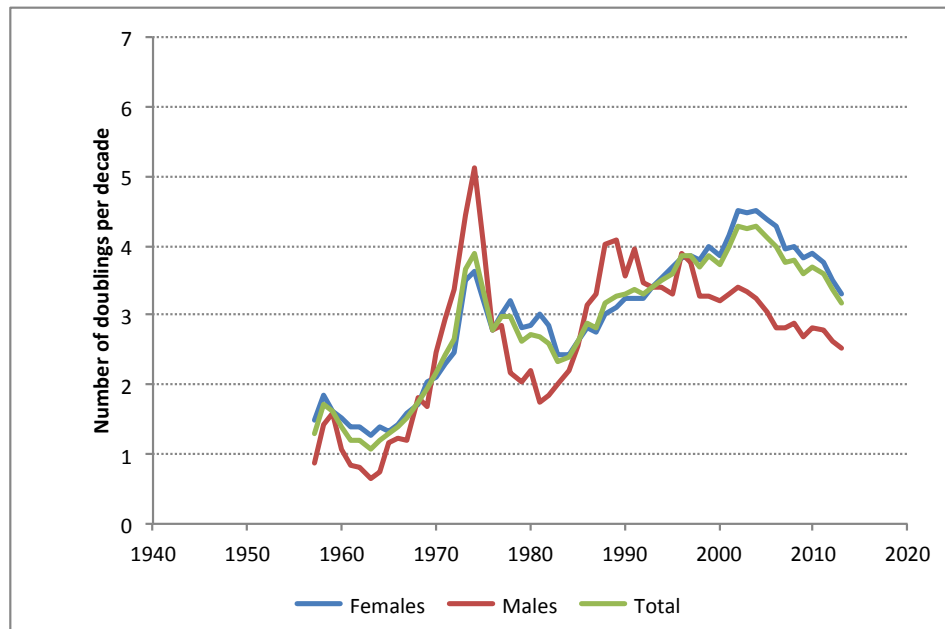
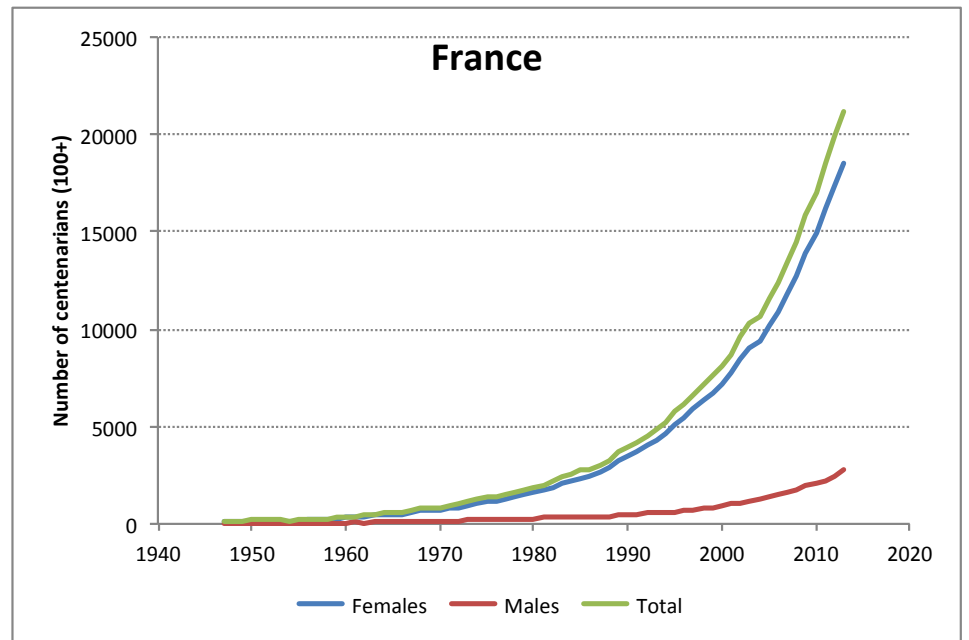
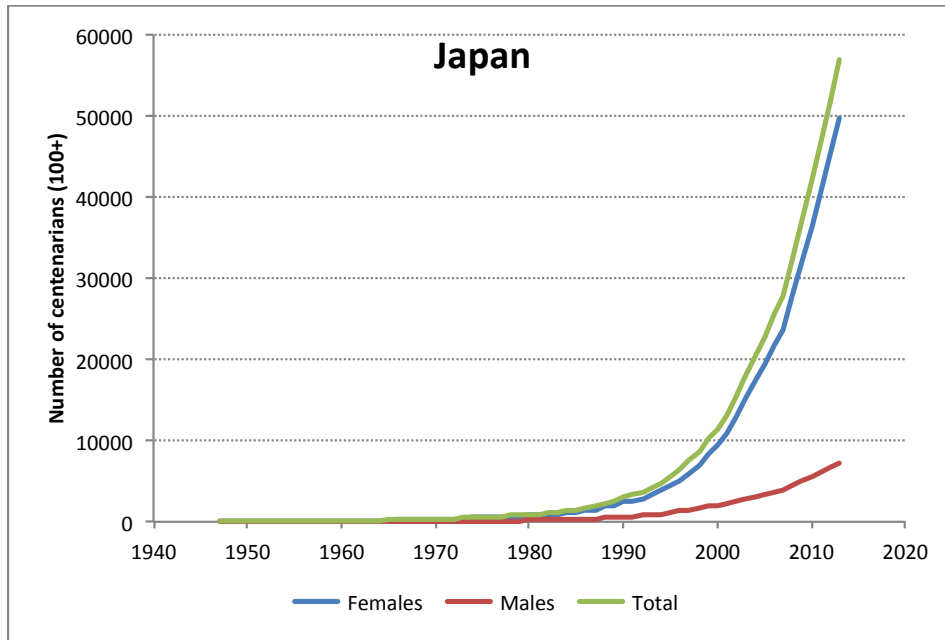
Japan 1890- 2005, Females



Japan 1890- 2010, Females

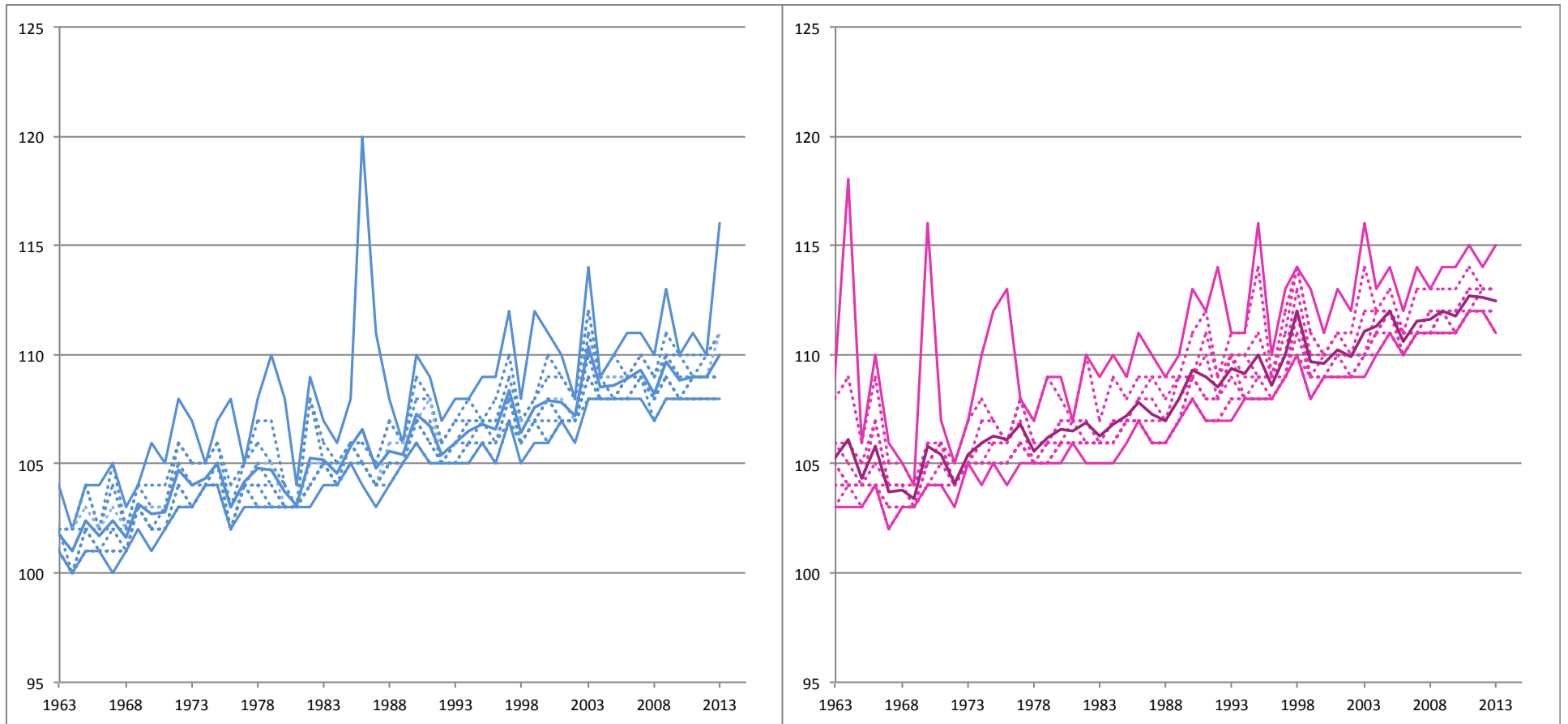


Doubling factor 100+



Maximum life span

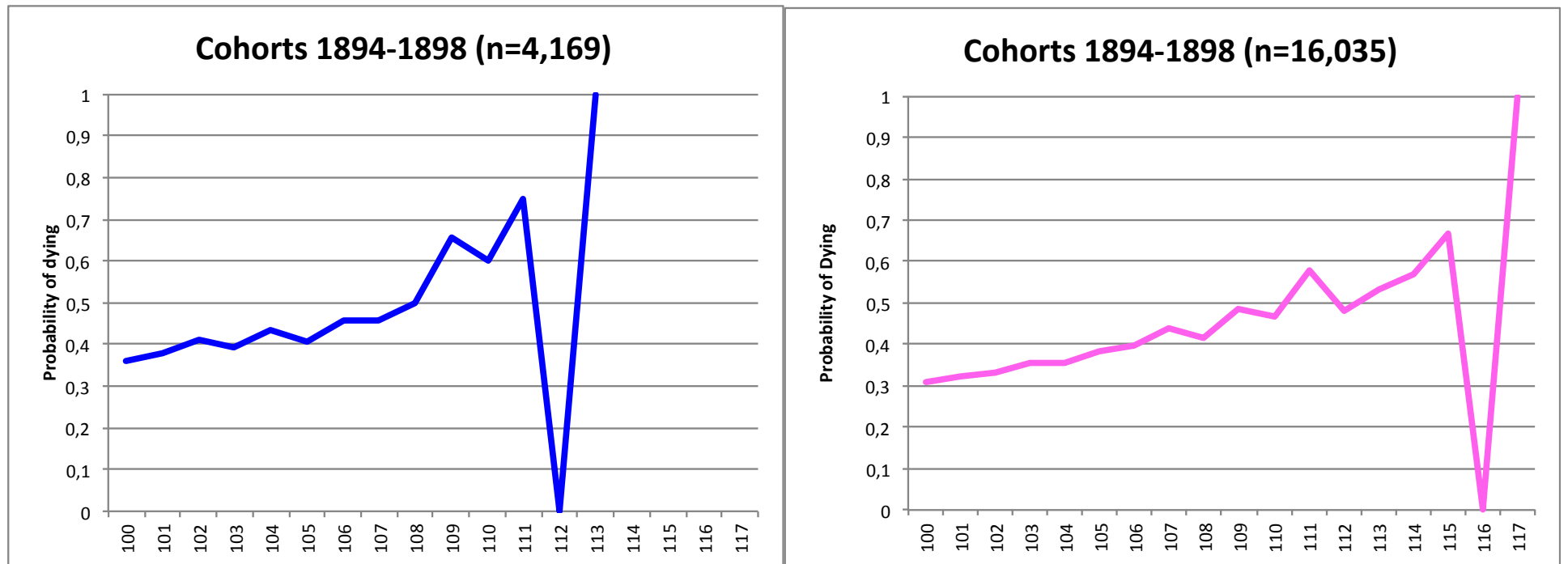
Maximum life span (empirical observations)



The 10 highest Maximum Reported Ages at Death (MRAD) in Japan since 1963 by sex

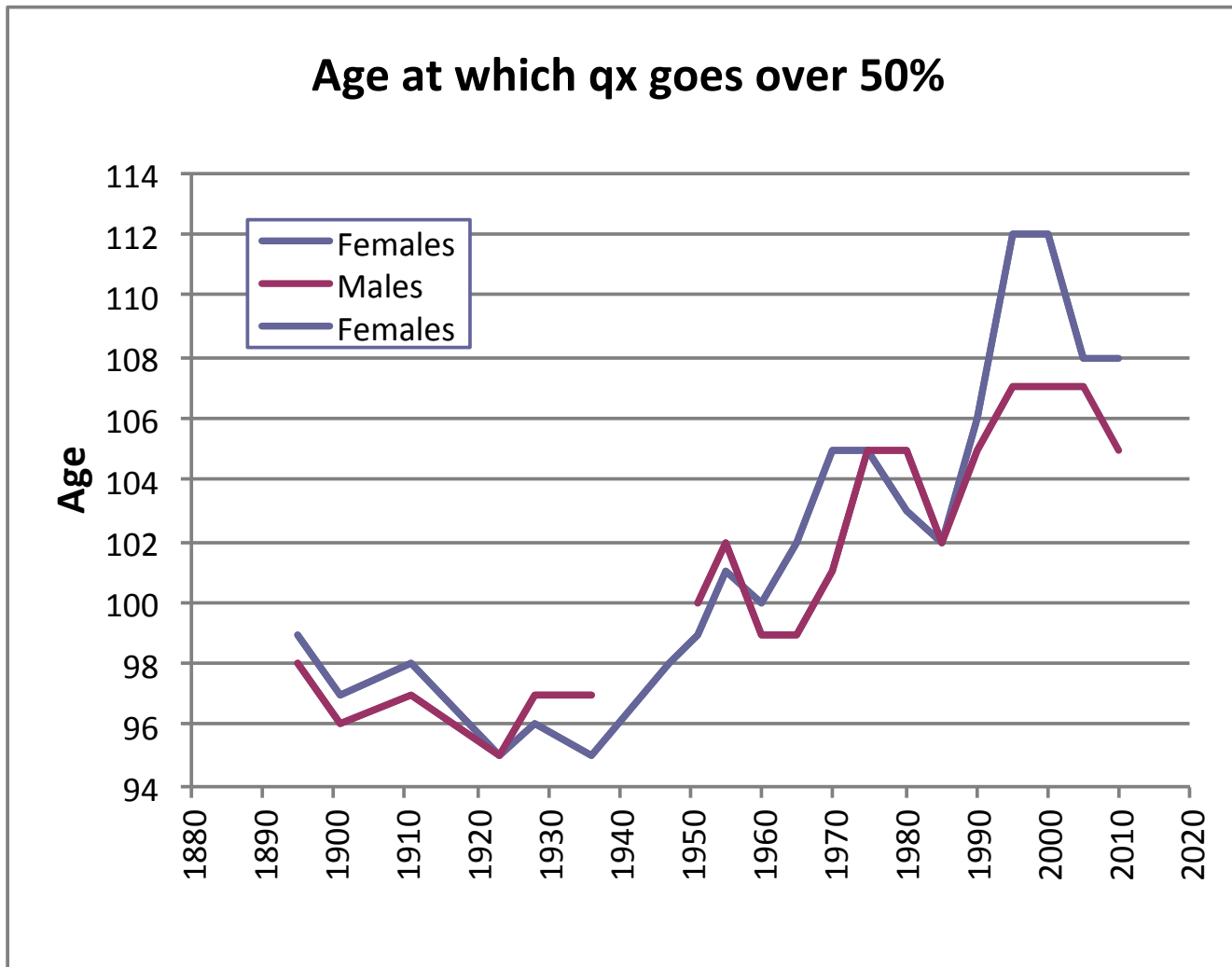
Mortality trajectory with age

Mortality trajectories with age observed in Japan for the last extinct birth cohorts

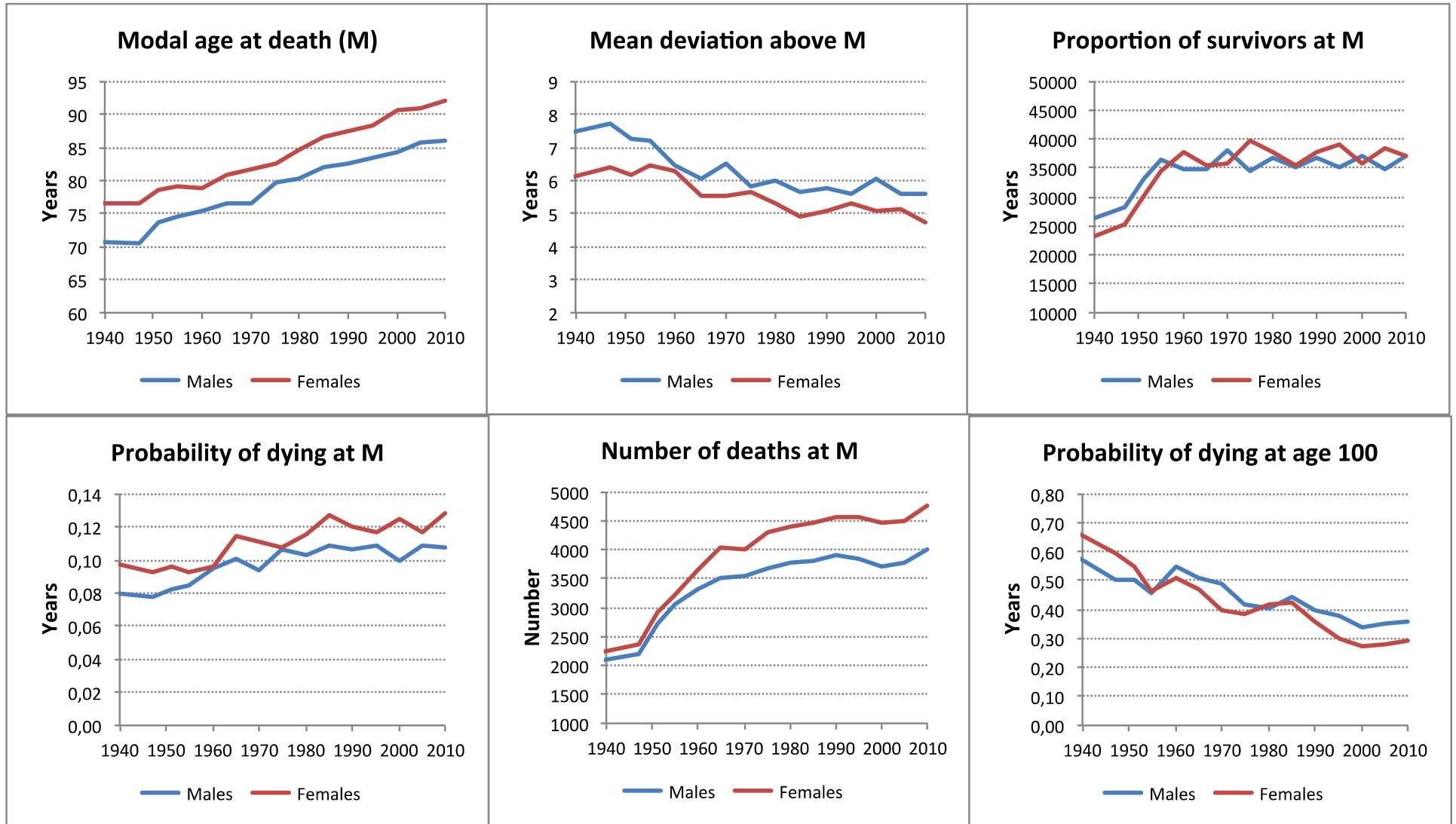


For males, $l(111) = 4$ and for females, $l(115) = 3$

At which age to close a life table?



Key parameters



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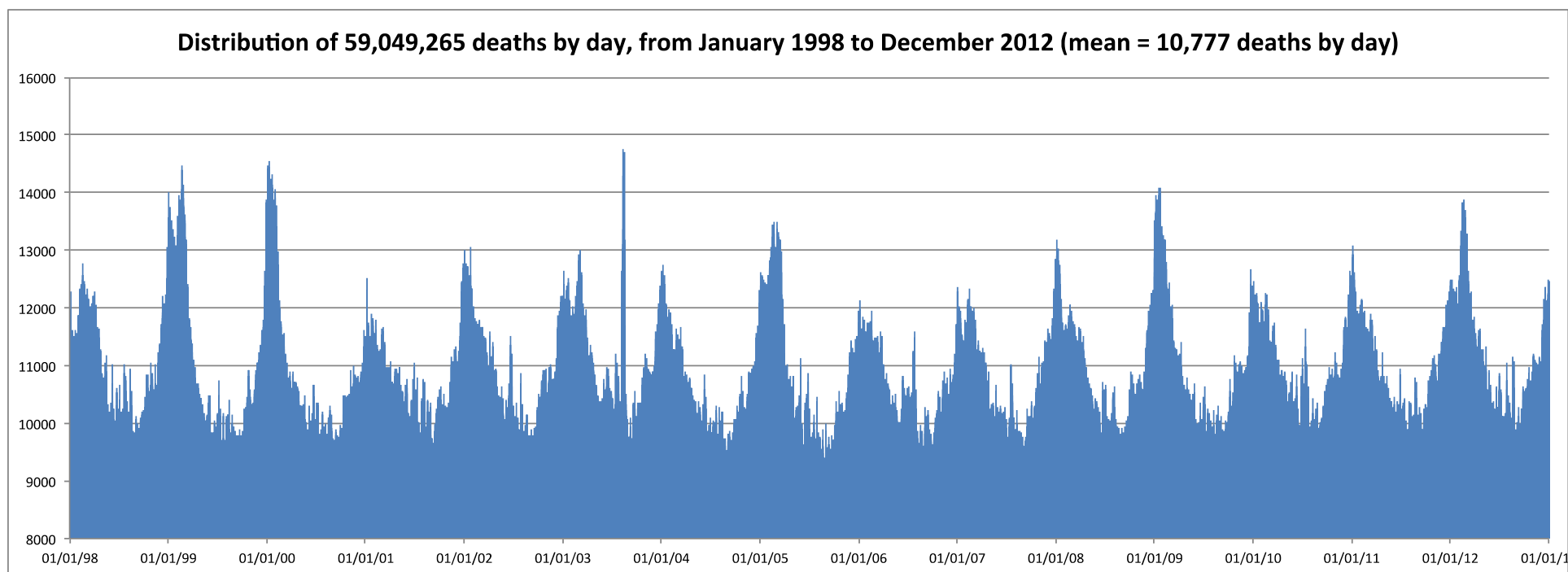
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Thank you for your attention!

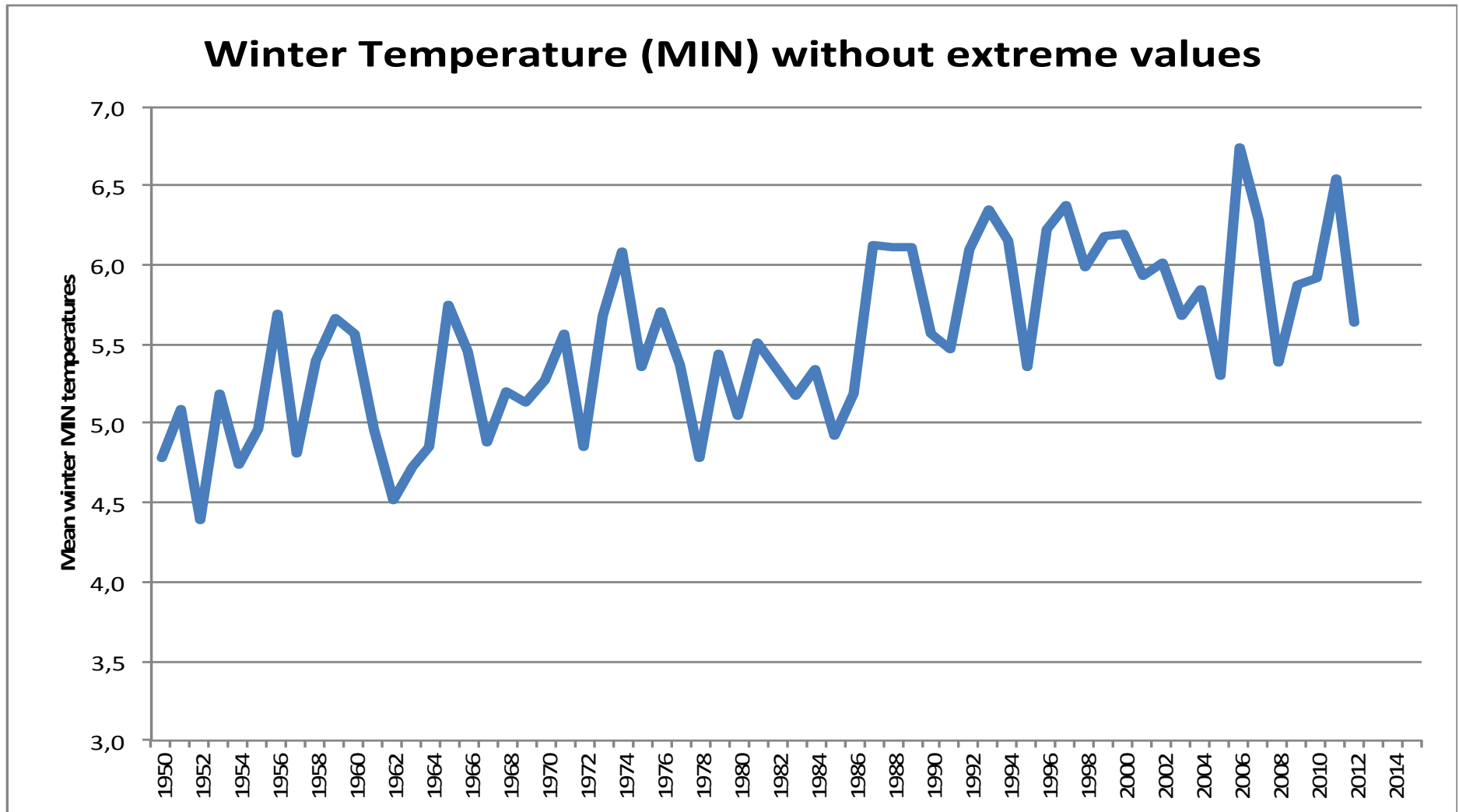
Longevity revolution and climate changes

Daily death counts from 1998 to 2012

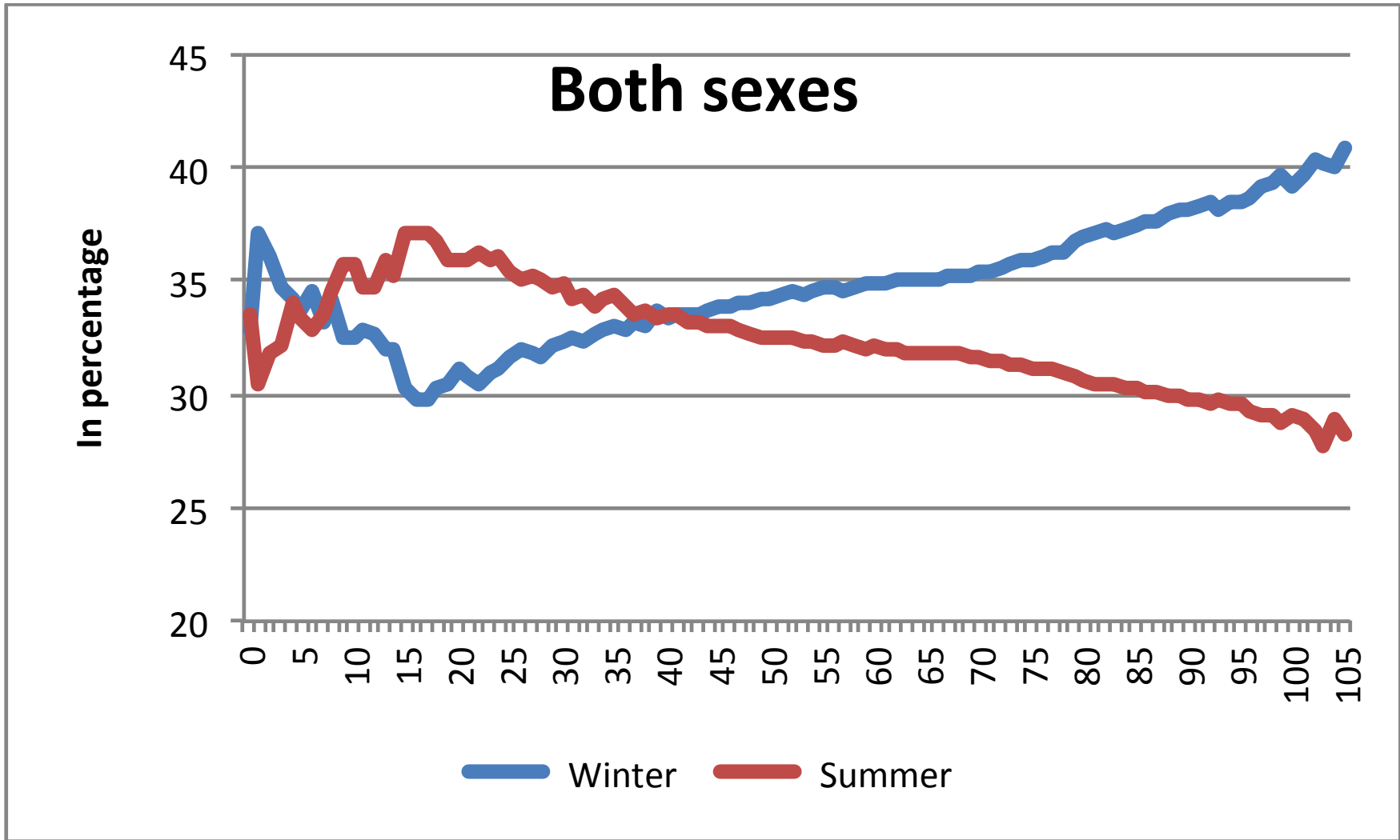


Daily death counts by sex and single age, from 1998 to 2012 (=5,479 days), for 177 European regions (NUTS2), belonging to 16 countries
5,479 days. A total of 59,049,265 deaths

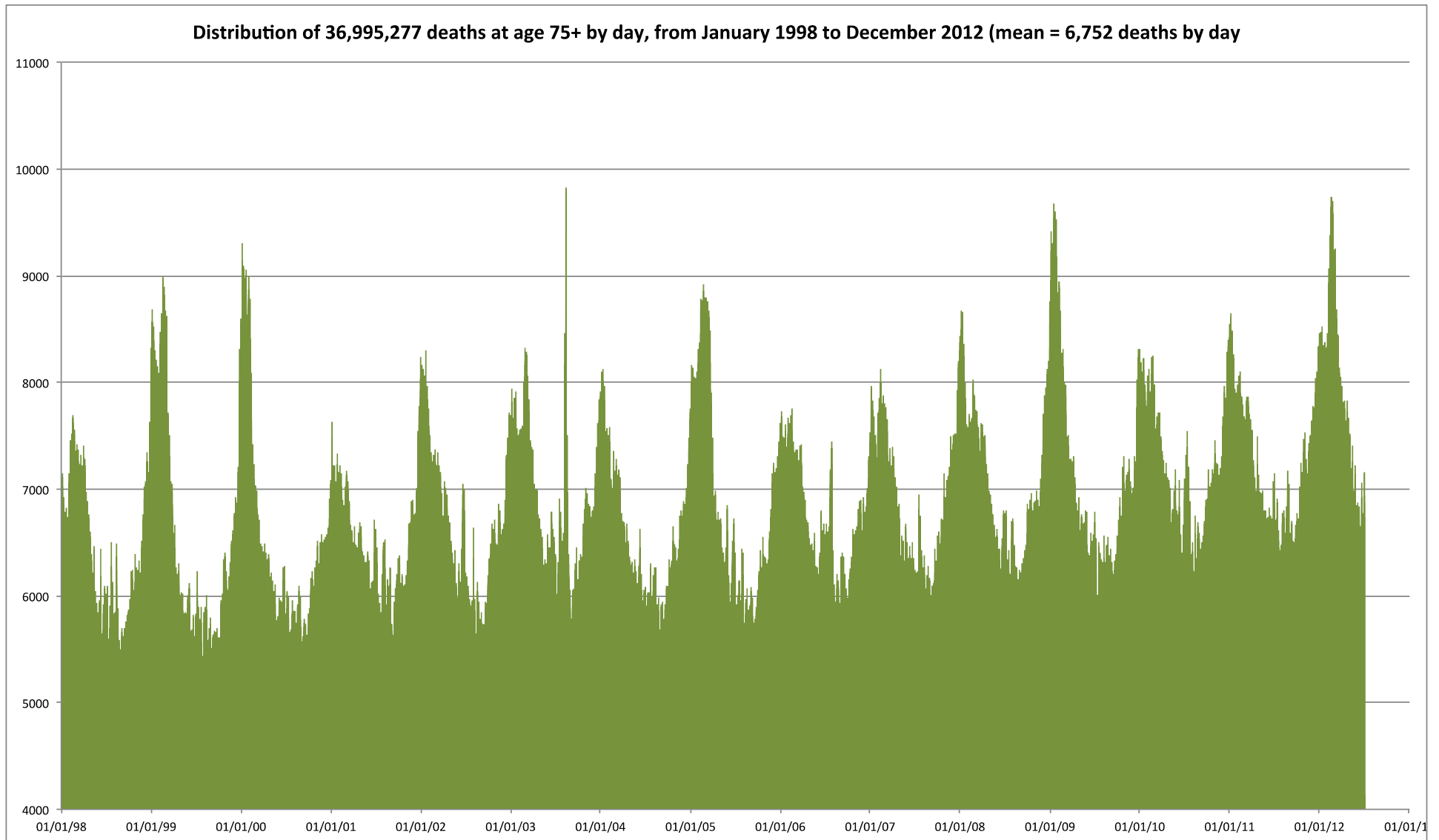
Mean winter temperature without extreme values, France 1950 - 2012



Winter deaths (Dec-Mar) vs. Summer deaths (Jun-Sep)



Daily death counts from 1998 to 2012, at age 75 and over



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