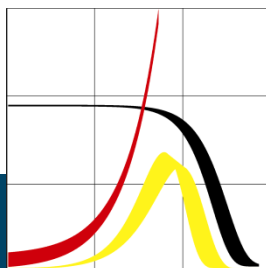




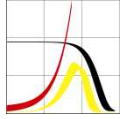
Max Planck Institute for Demographic Research, Rostock



George Myers Lecture
Aging Population: Findings and Prospects

James W. Vaupel
(and Kaare Christensen, Gabriele Doblhammer and Roland Rau)

The 21st REVES Conference
Copenhagen, 28 May 2009

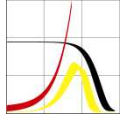


George Myers Lecture

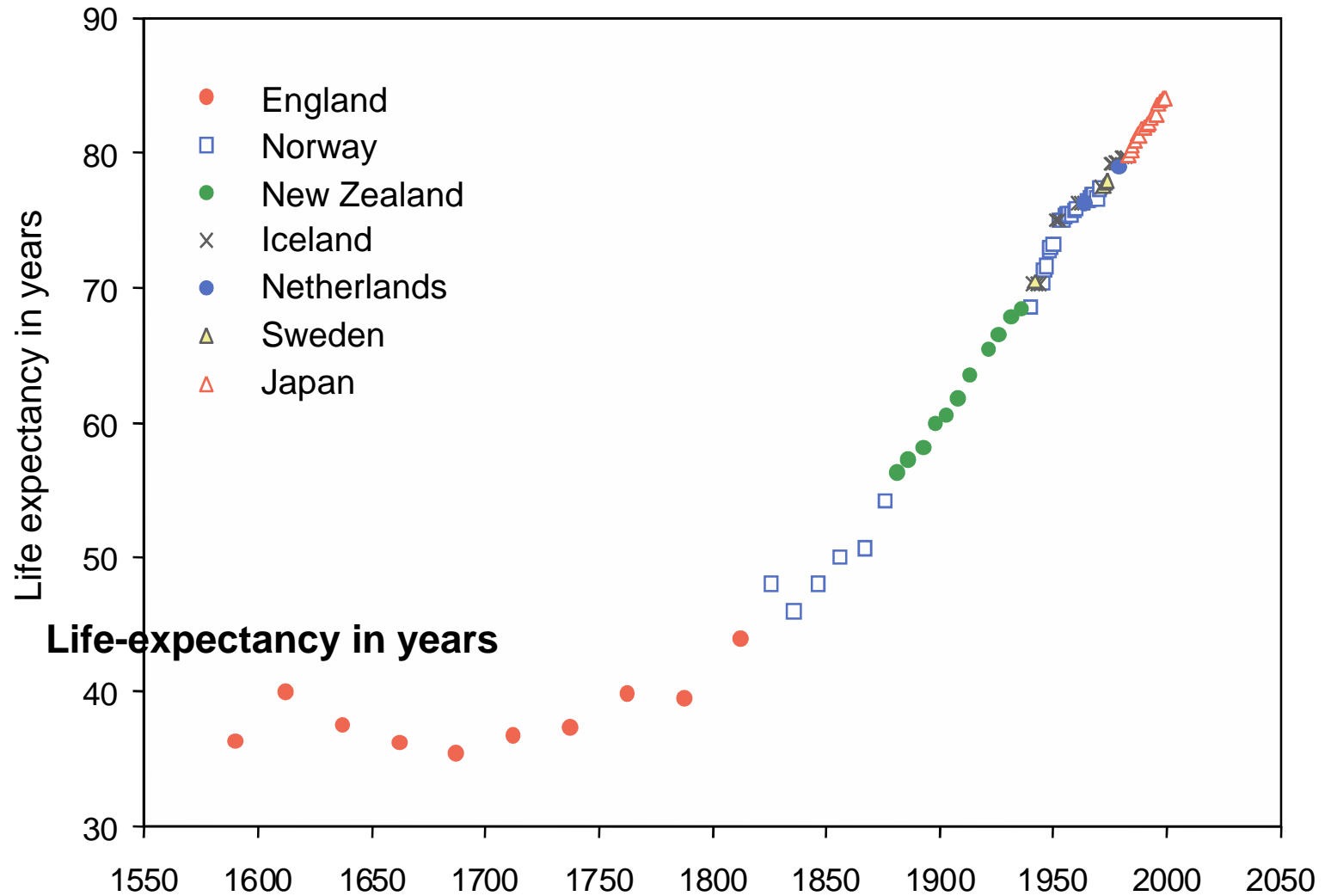
The Aging Revolution: *Paradigm shift--*

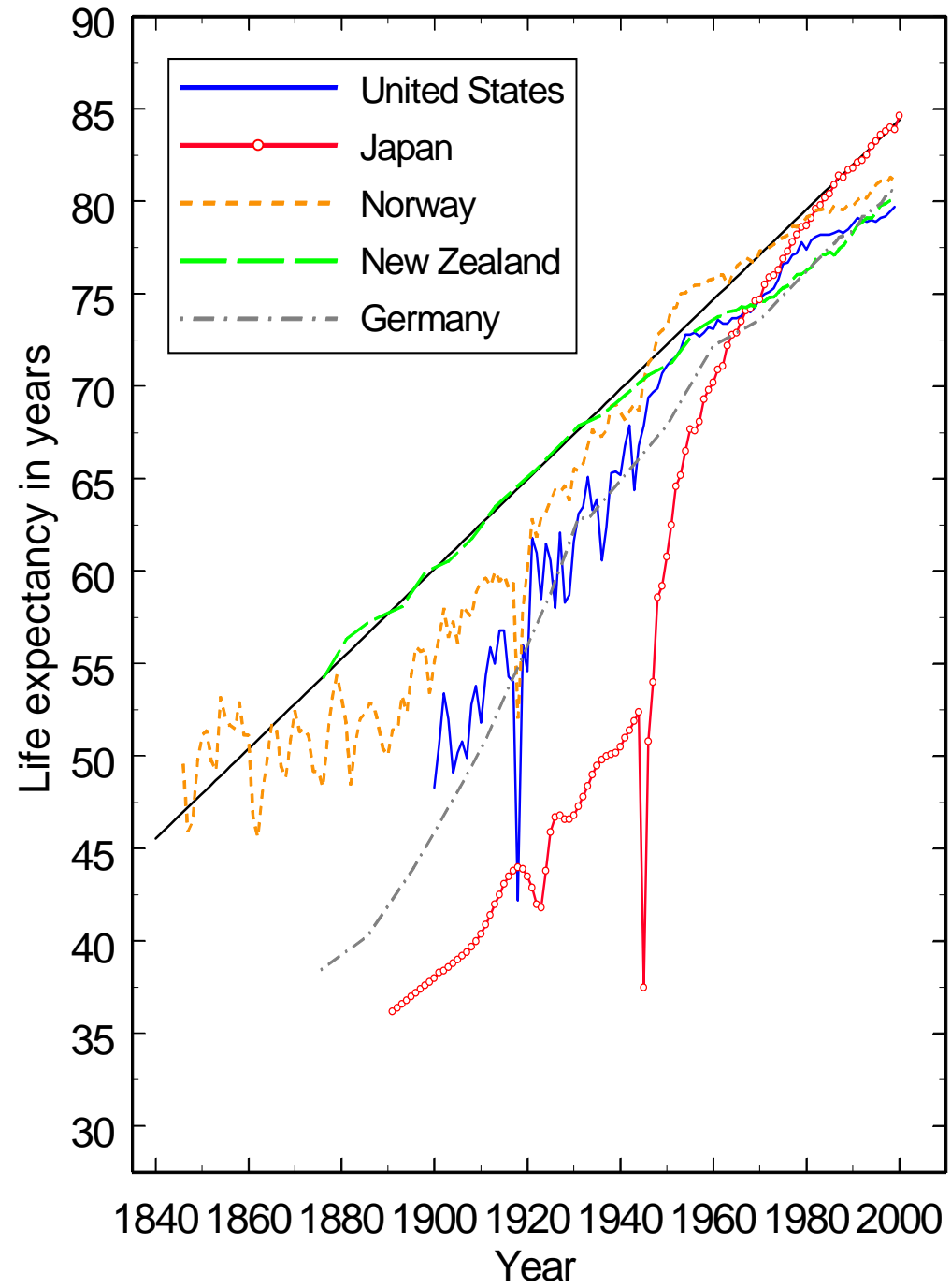
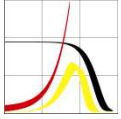
From: Nothing can be done
about aging

To: Aging is plastic



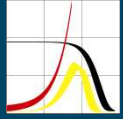
Record life expectancy for females since 1590





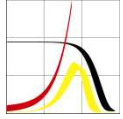
Life Expectancy in Austria

<u>Year</u>	<u>Females</u>	<u>Males</u>
1950	67.33	62.23
1970	73.43	66.51
1990	78.87	72.23
2005	82.24	76.66
<u>Hours/day</u>		
1950-1990	6.9	6.0
1990-2005	5.4	7.1

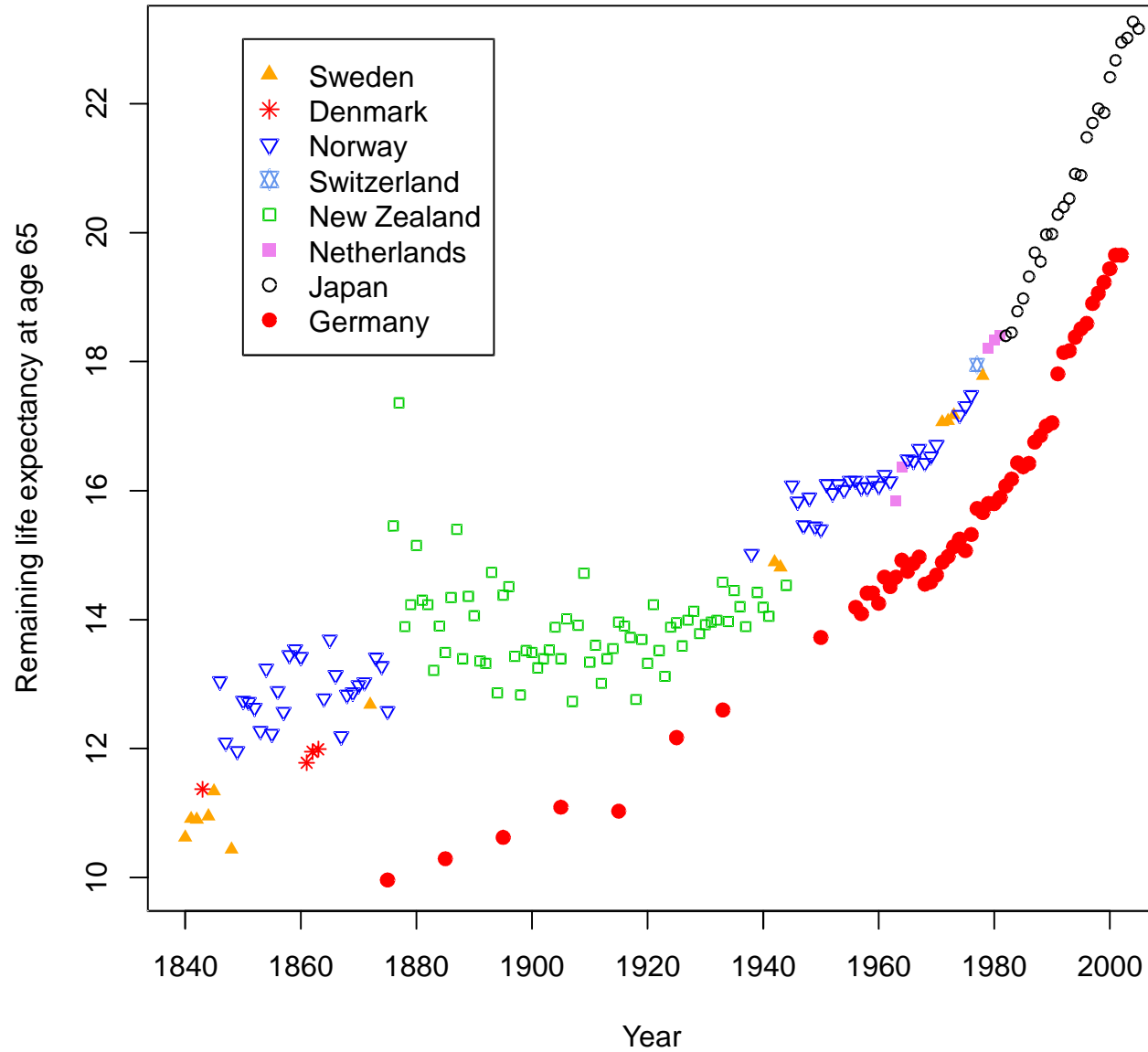


Age-Specific Contributions to the Increase of Life Expectancy among Women 1850 to 2007

Age-Group	1850-1900	1900-1925	1925-1950	1950-1975	1975-1990	1990-2007
0-14	62.13	54.75	30.99	29.72	11.20	5.93
15-49	29.09	31.55	37.64	17.70	6.47	4.67
50-64	5.34	9.32	18.67	16.27	24.29	10.67
65-79	3.17	4.44	12.72	28.24	40.57	37.22
80+	0.27	-0.06	-0.03	8.07	17.47	41.51



Remaining Life Expectancy at Age 65

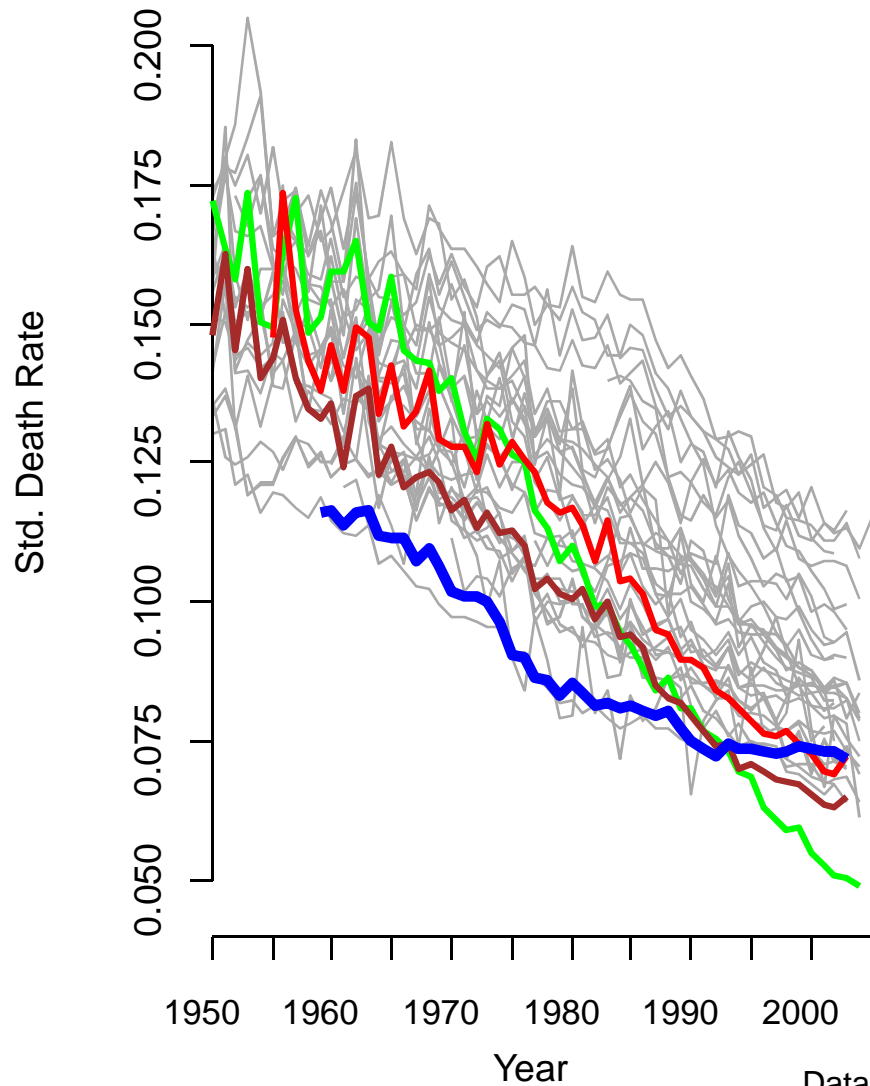


Remaining Life Expectancy at Age 65 in Austria

<u>Year</u>	<u>Females</u>	<u>Males</u>
1950	13.76	11.54
1970	14.88	11.69
1990	17.93	14.35
2005	20.34	16.99
<u>Hours/day</u>		
1950-1990	2.5	1.7
1990-2005	3.9	4.2

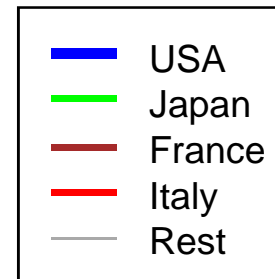
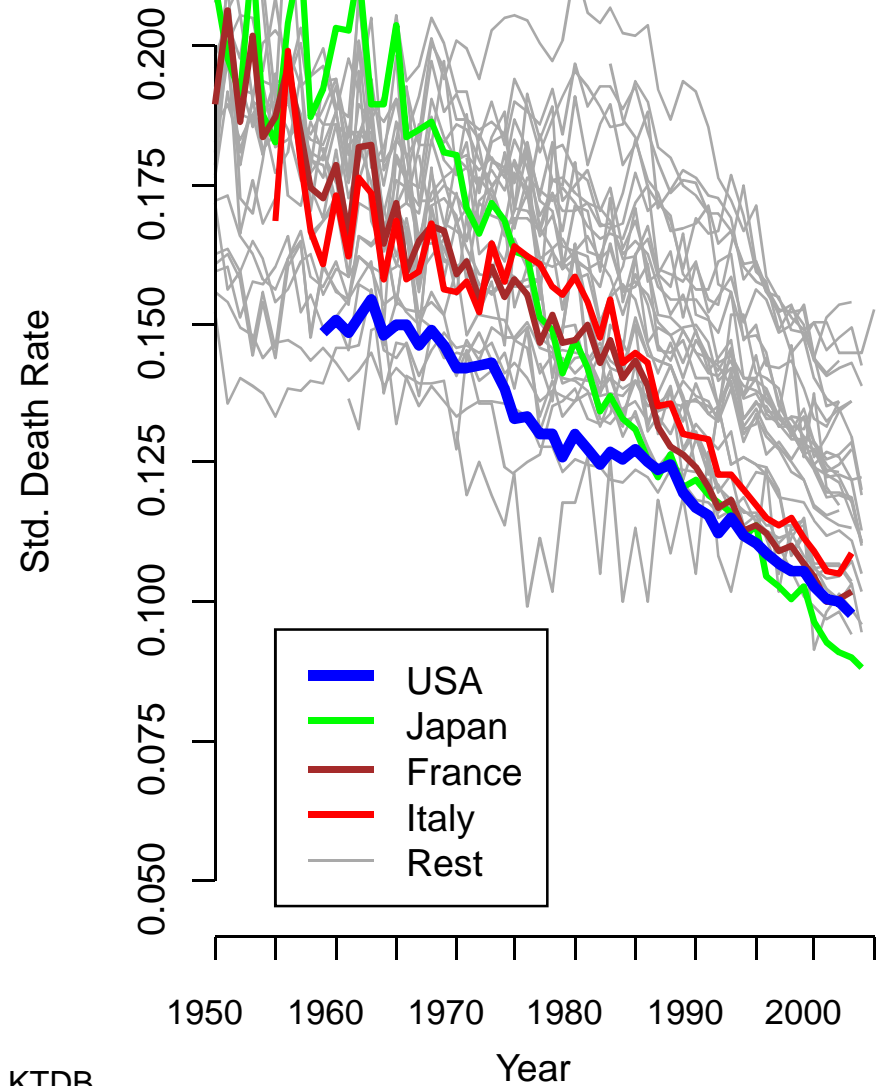
Age-Standardized Death Rates

Women, Ages 80-89



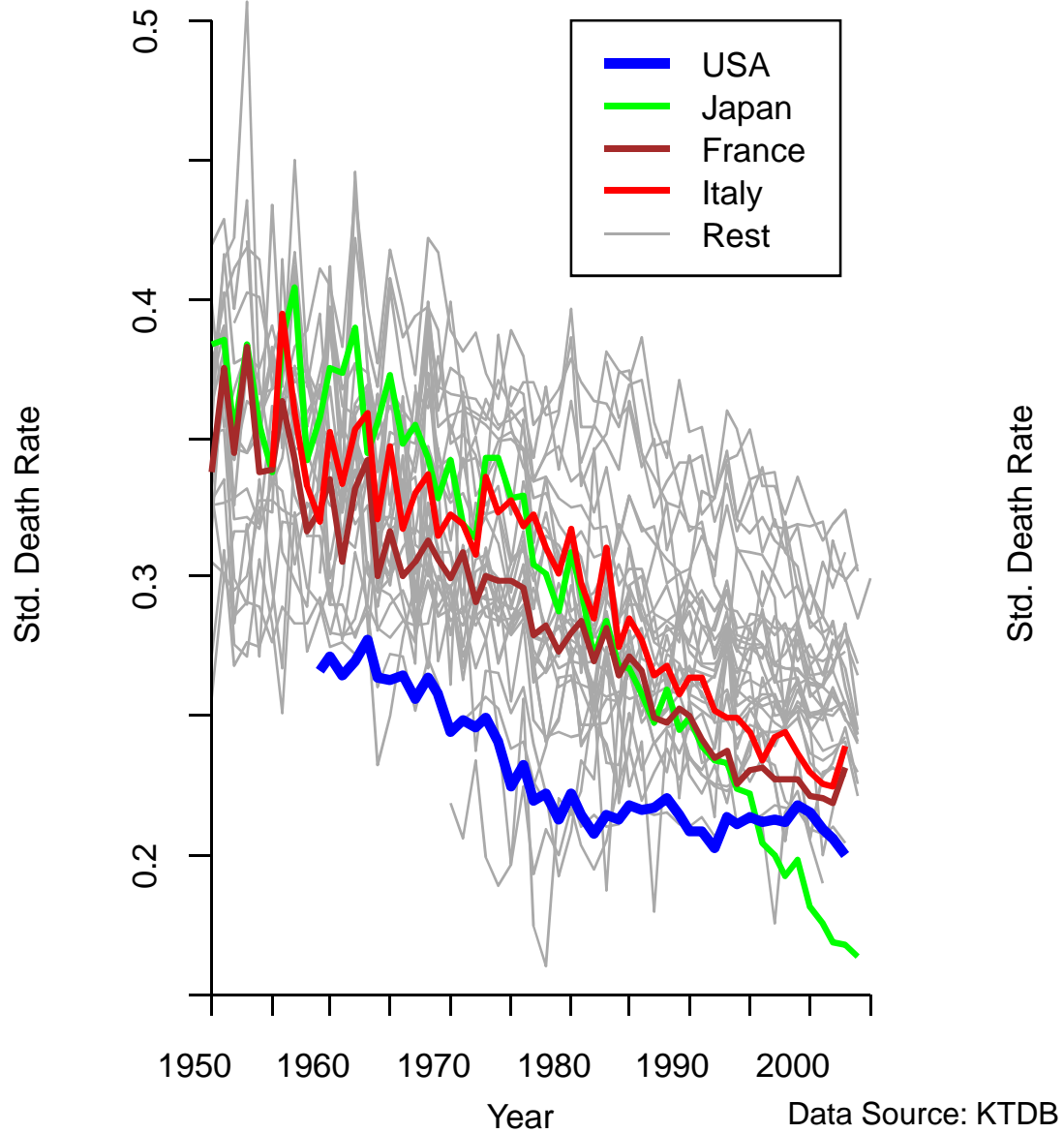
Data Source: KTDB

Men, Ages 80-89

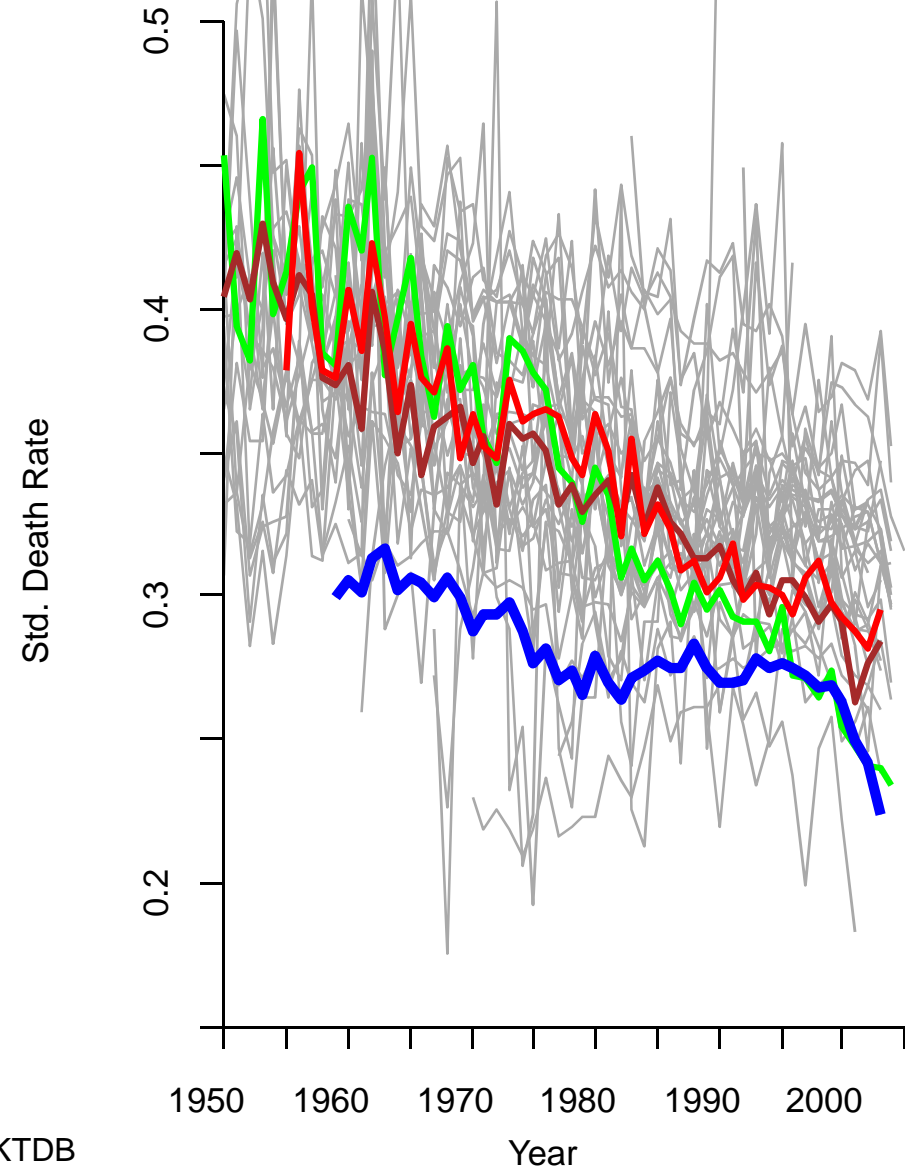


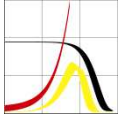
Age-Standardized Death Rates

Women, Ages 90-99

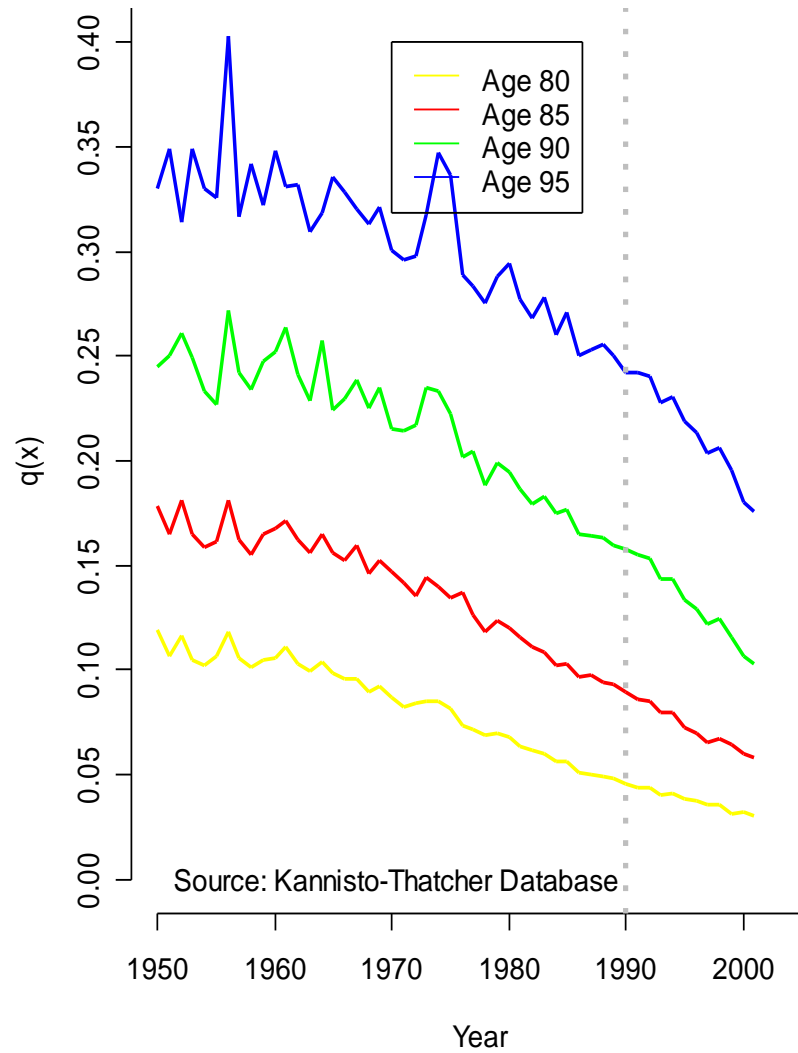


Men, Ages 90-99

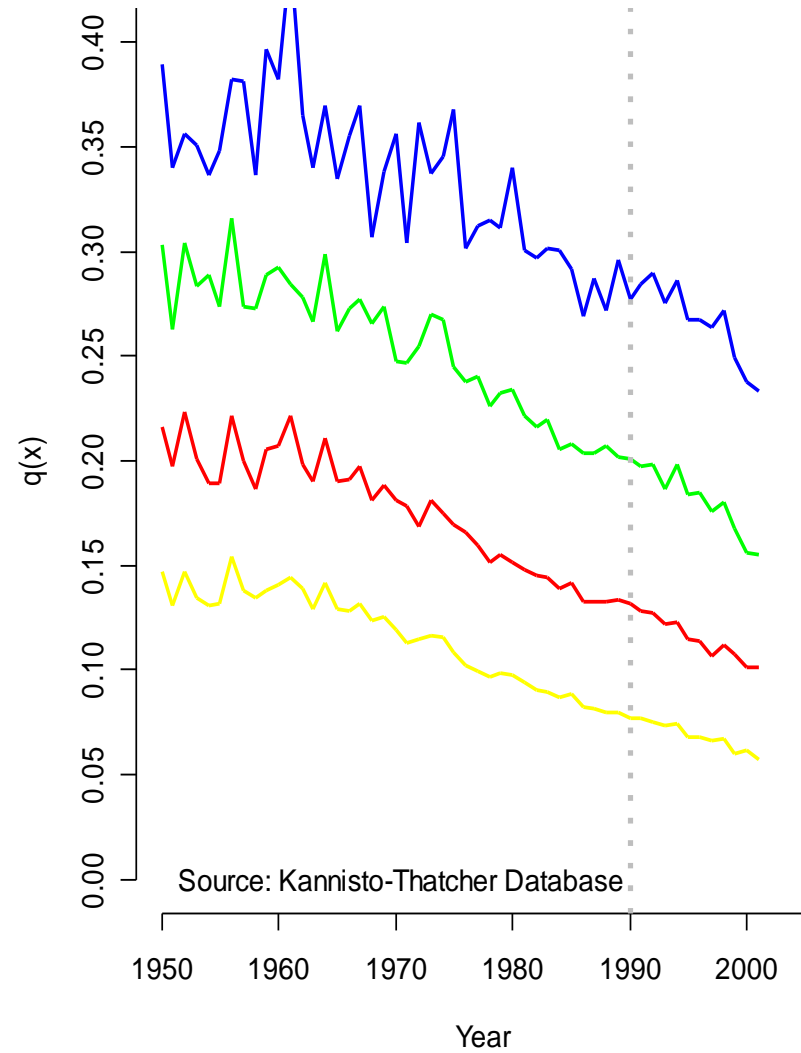


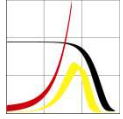


q(x), Japan, Women

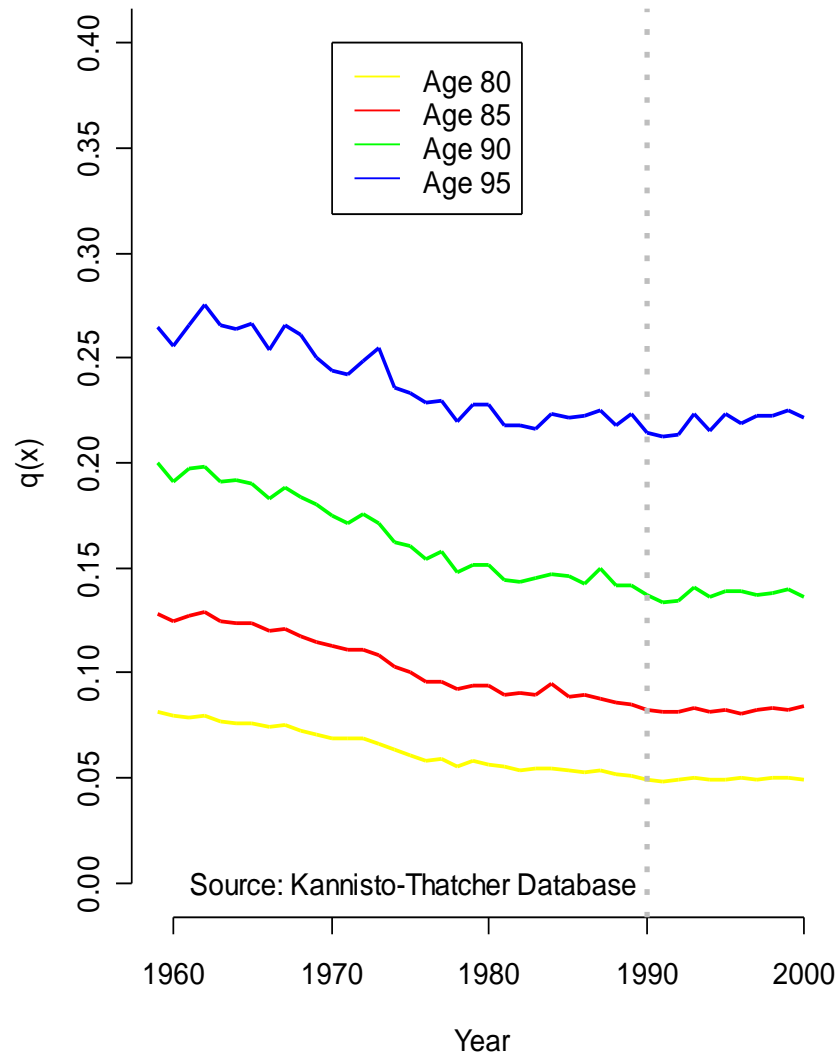


q(x), Japan, Men

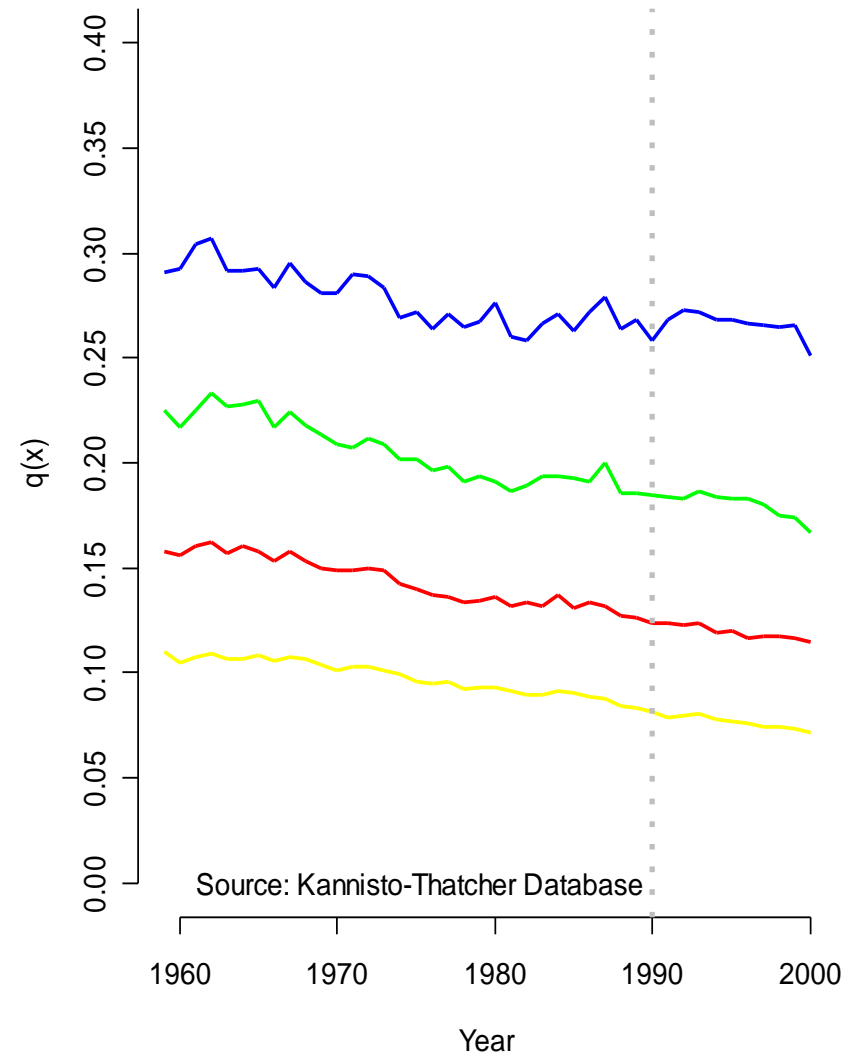




q(x), USA, Women

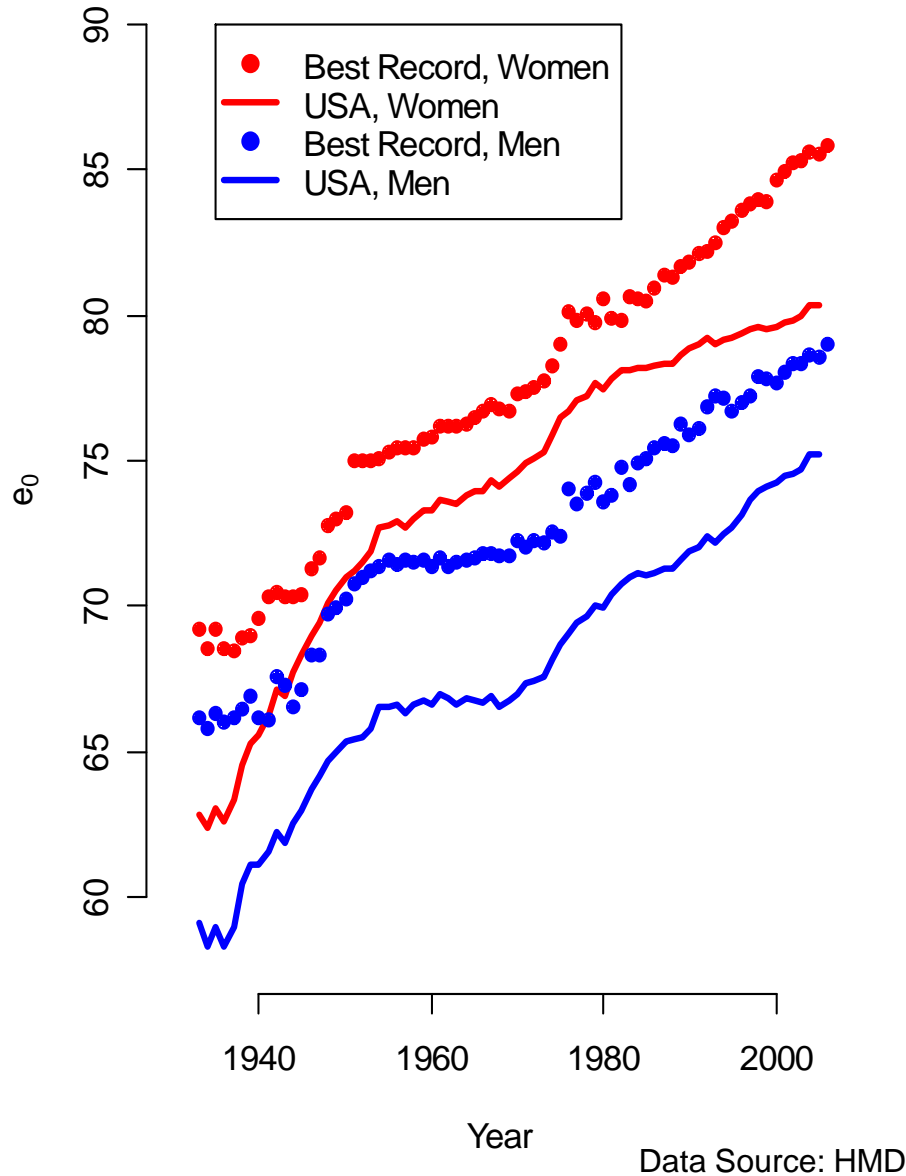


q(x), USA, Men

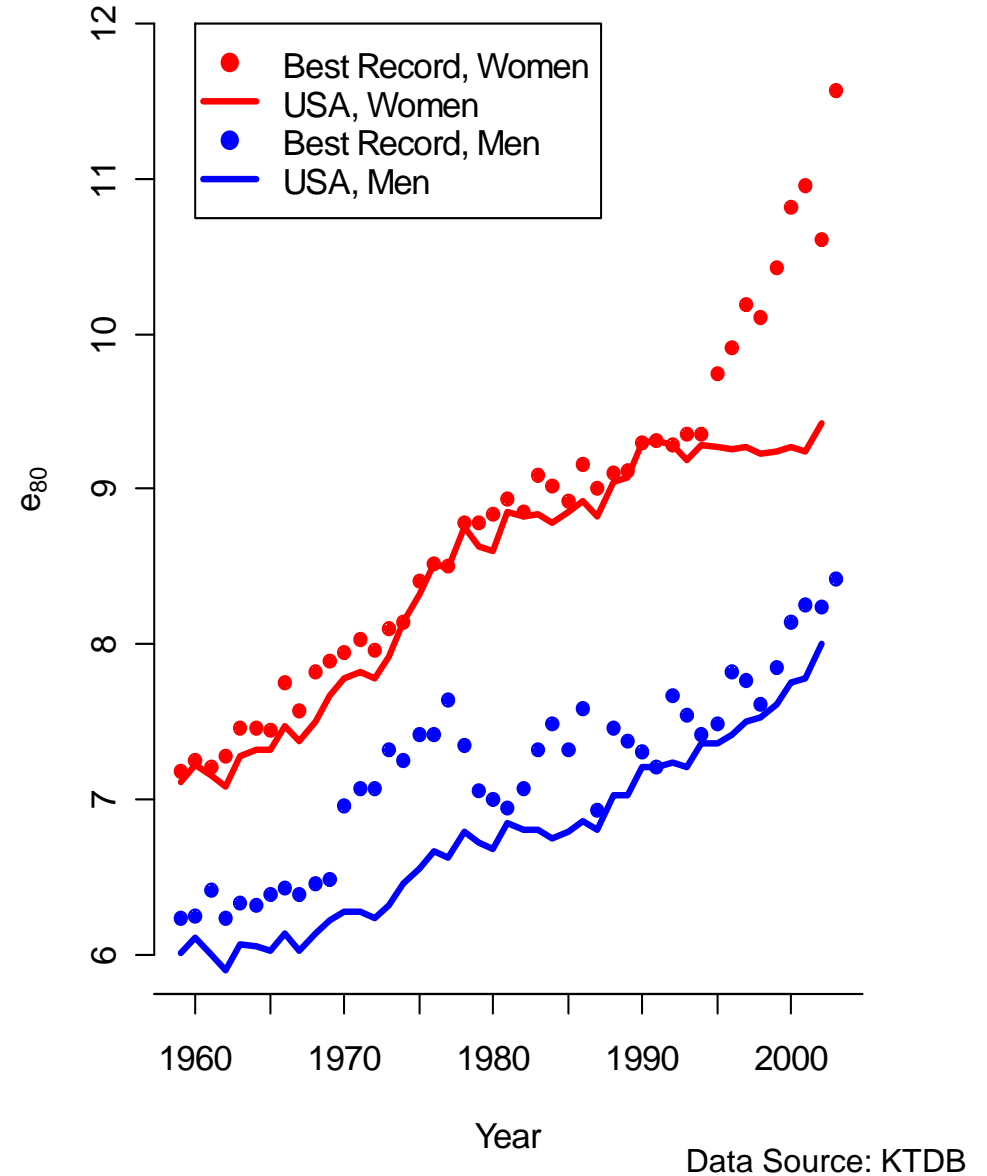


Life Expectancy in the USA and the Best Practice Country

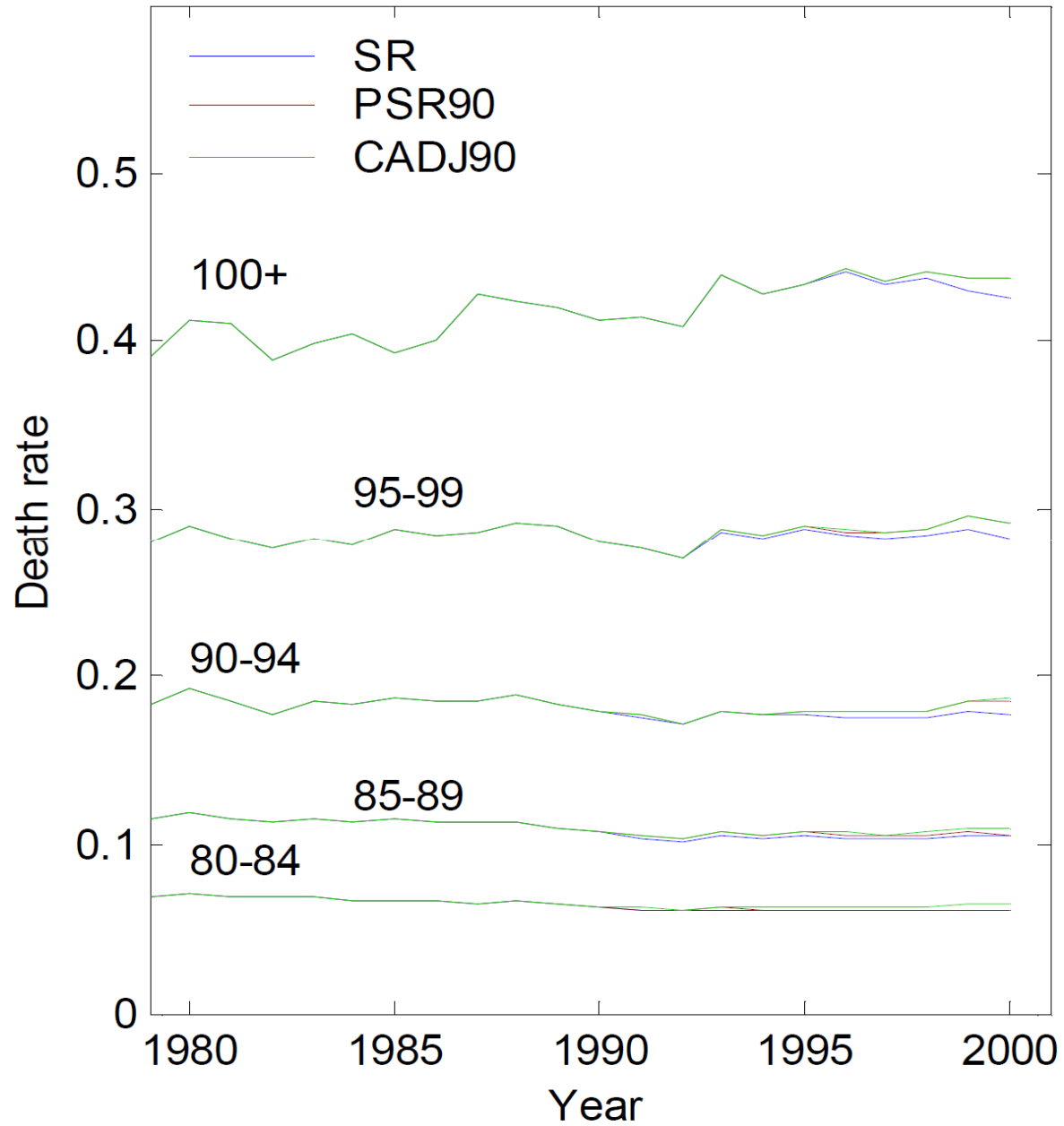
Life Expectancy at Birth



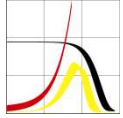
Life Expectancy at Age 80



Females, Native, White

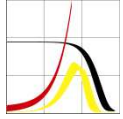


Source: Andreev 2004

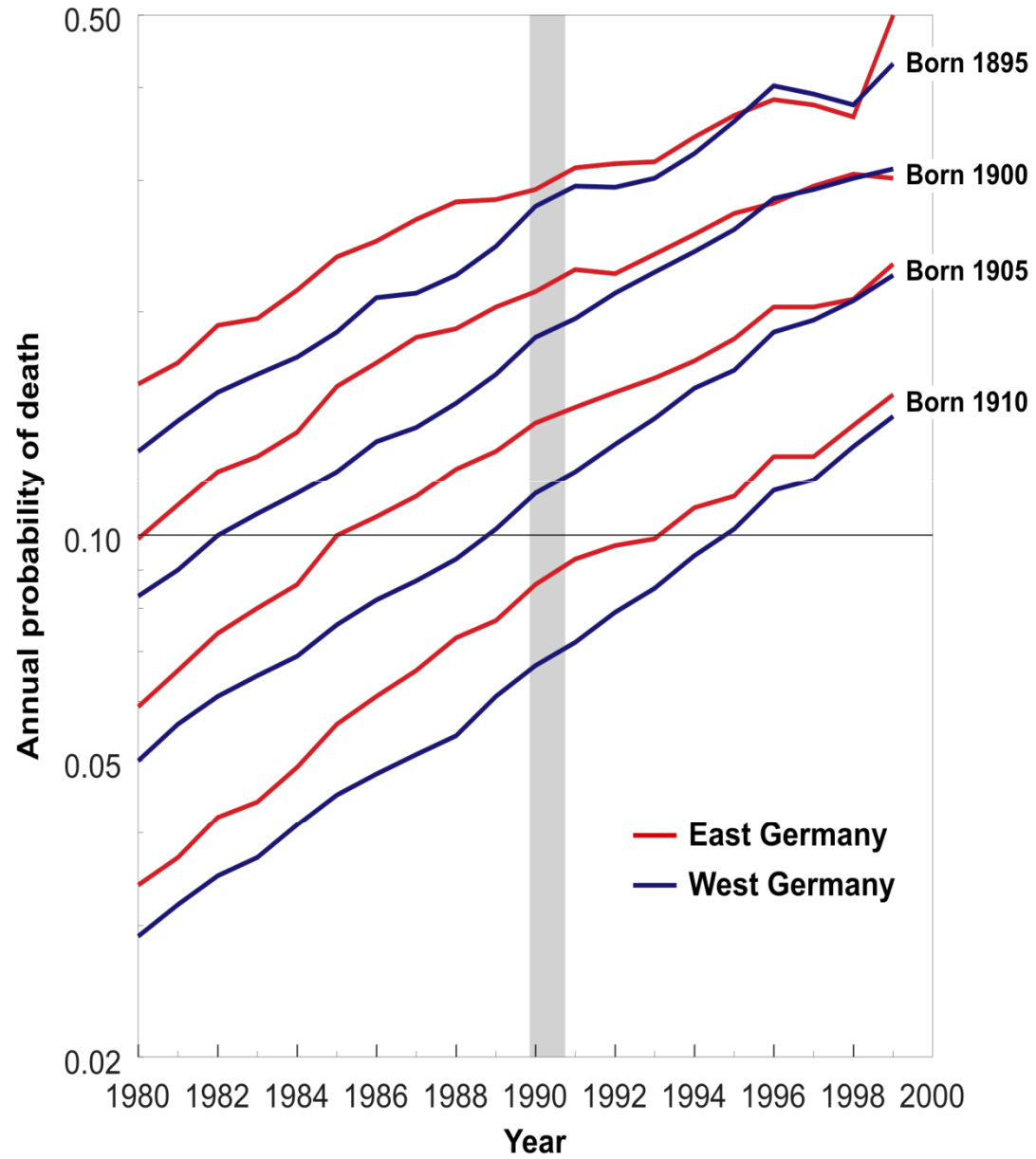


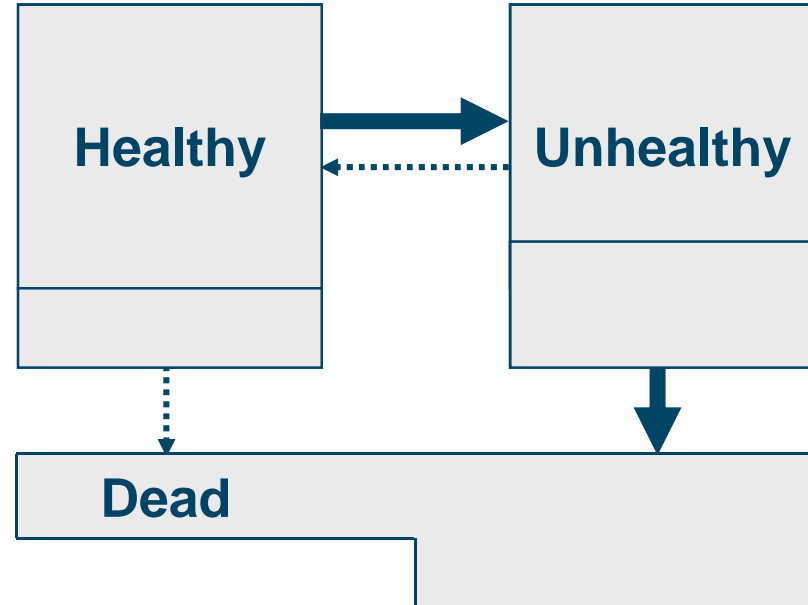
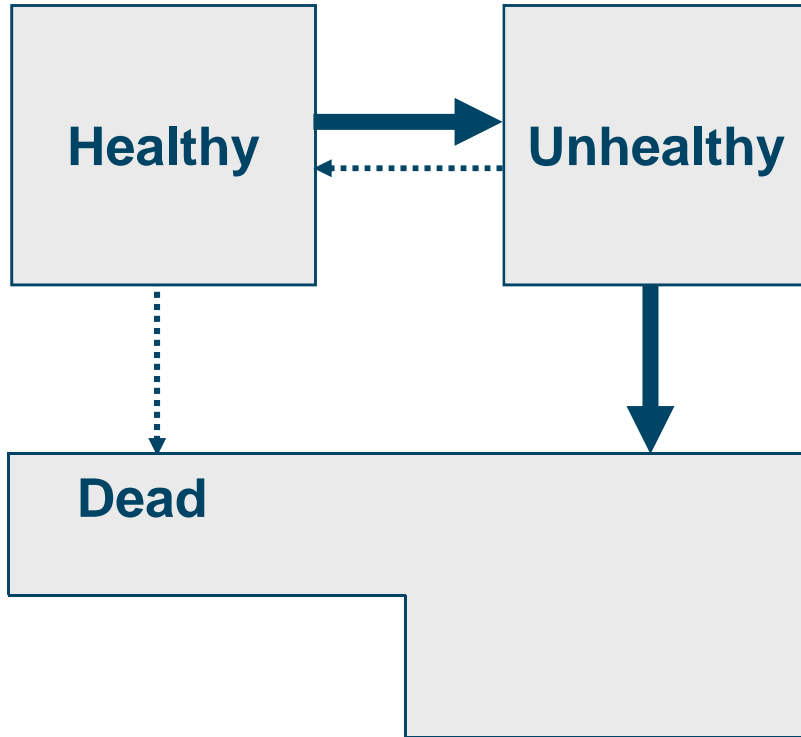
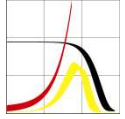
Divergent Mortality Trends

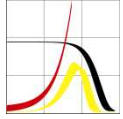
- United States
- Denmark
- The Netherlands



It's never too late

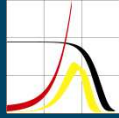






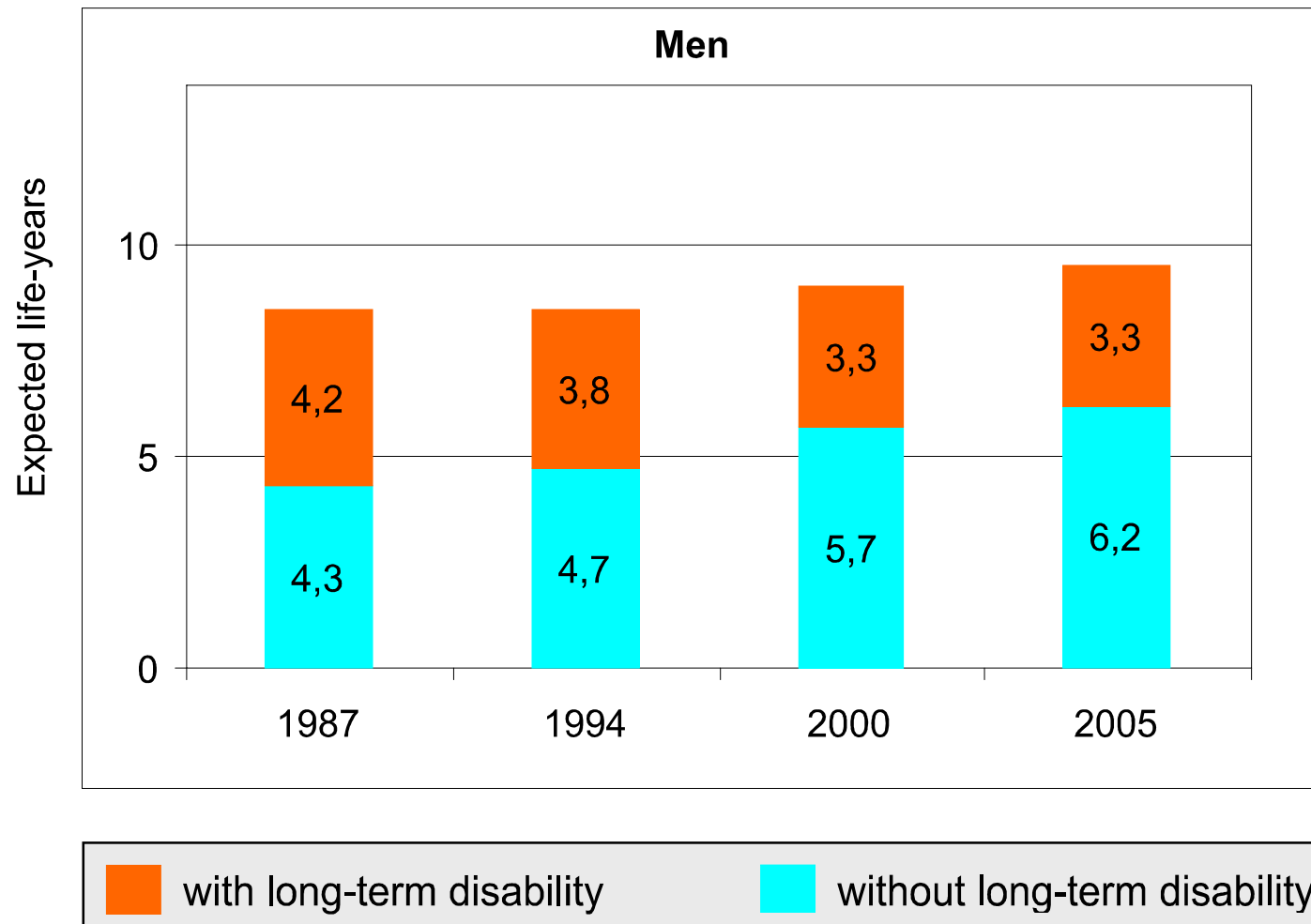
Trends in:

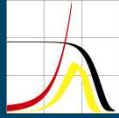
- Diseases and conditions
- Functional limitations
- Disability
- Health expectancies
- Gender differences



Long-term disability

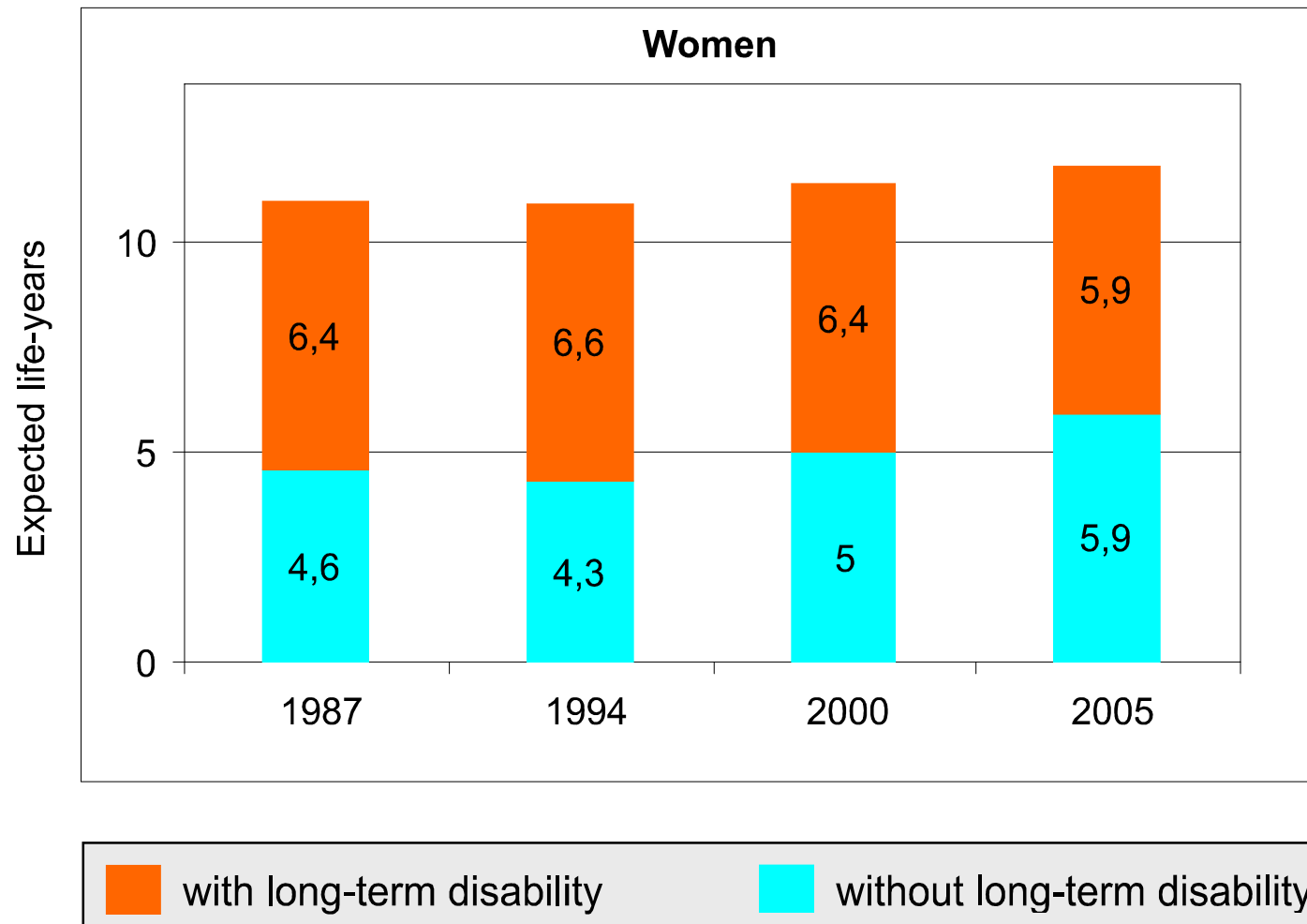
Life expectancy without and with long-term disability at age 75 in Denmark in 1987, 1994, 2000 and 2005.

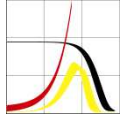




Long-term disability

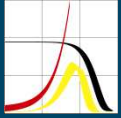
Life expectancy without and with long-term disability at age 75 in Denmark in 1987, 1994, 2000 and 2005.





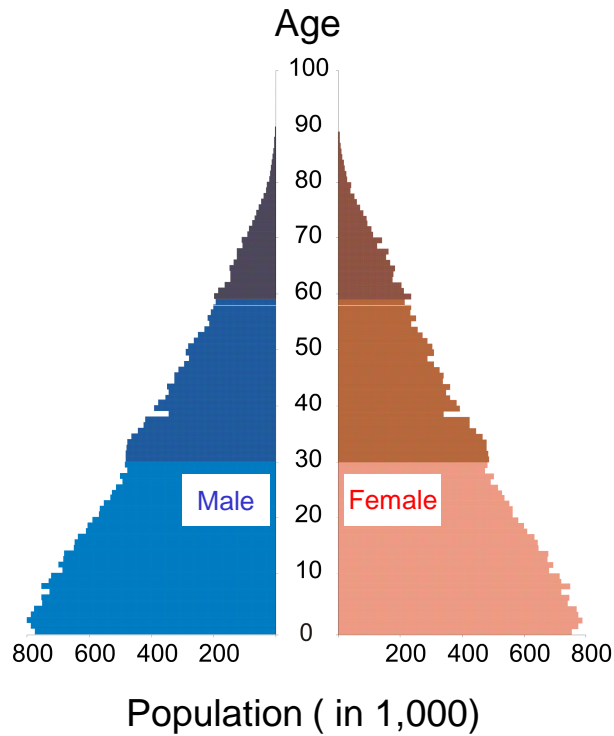
Consequences:

- Living longer and better
- Failure of Success?
- Fourth age?
- Societal consequences

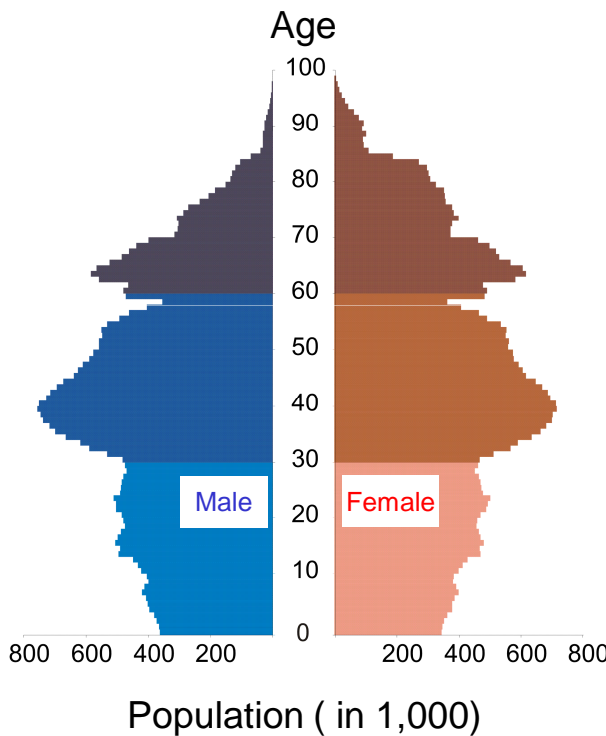


Population Pyramids for Germany

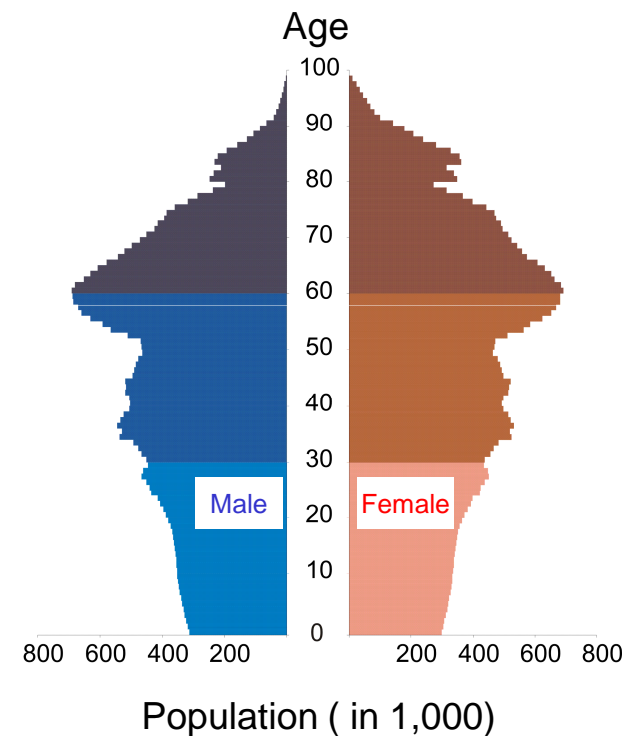
Germany 1910

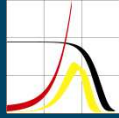


Germany 2005



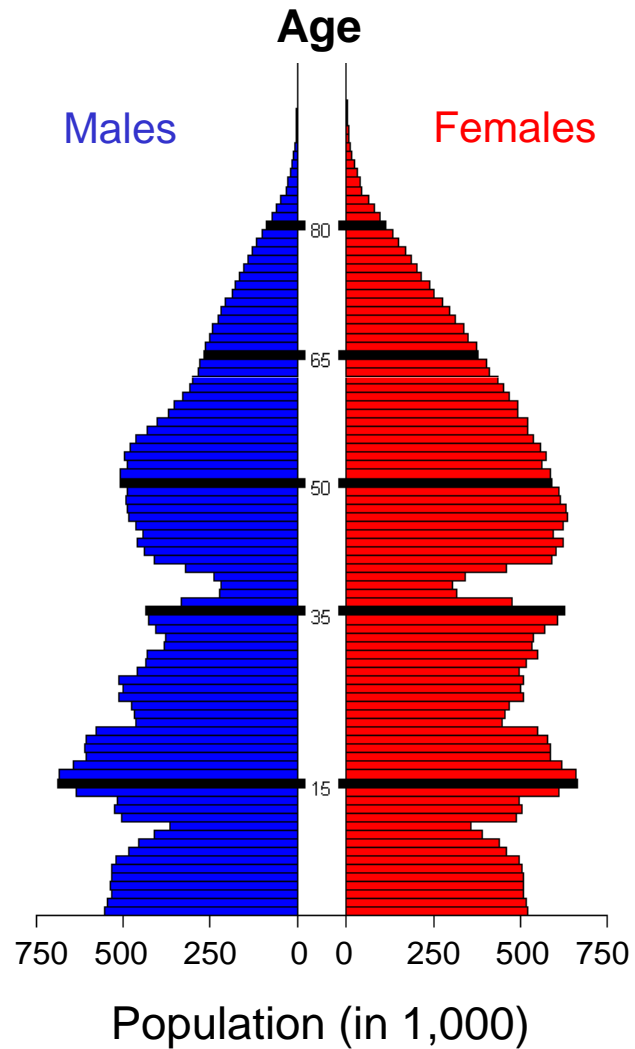
Germany 2025



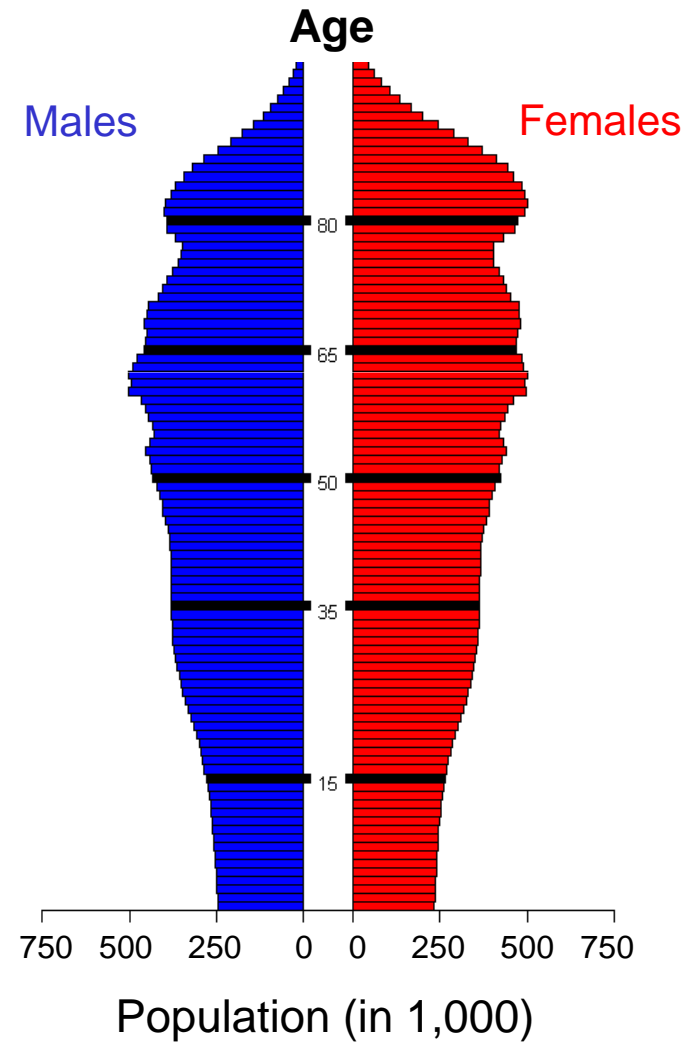


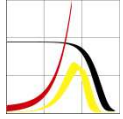
Population Pyramids for Germany

Germany 1956



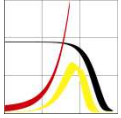
Germany 2050



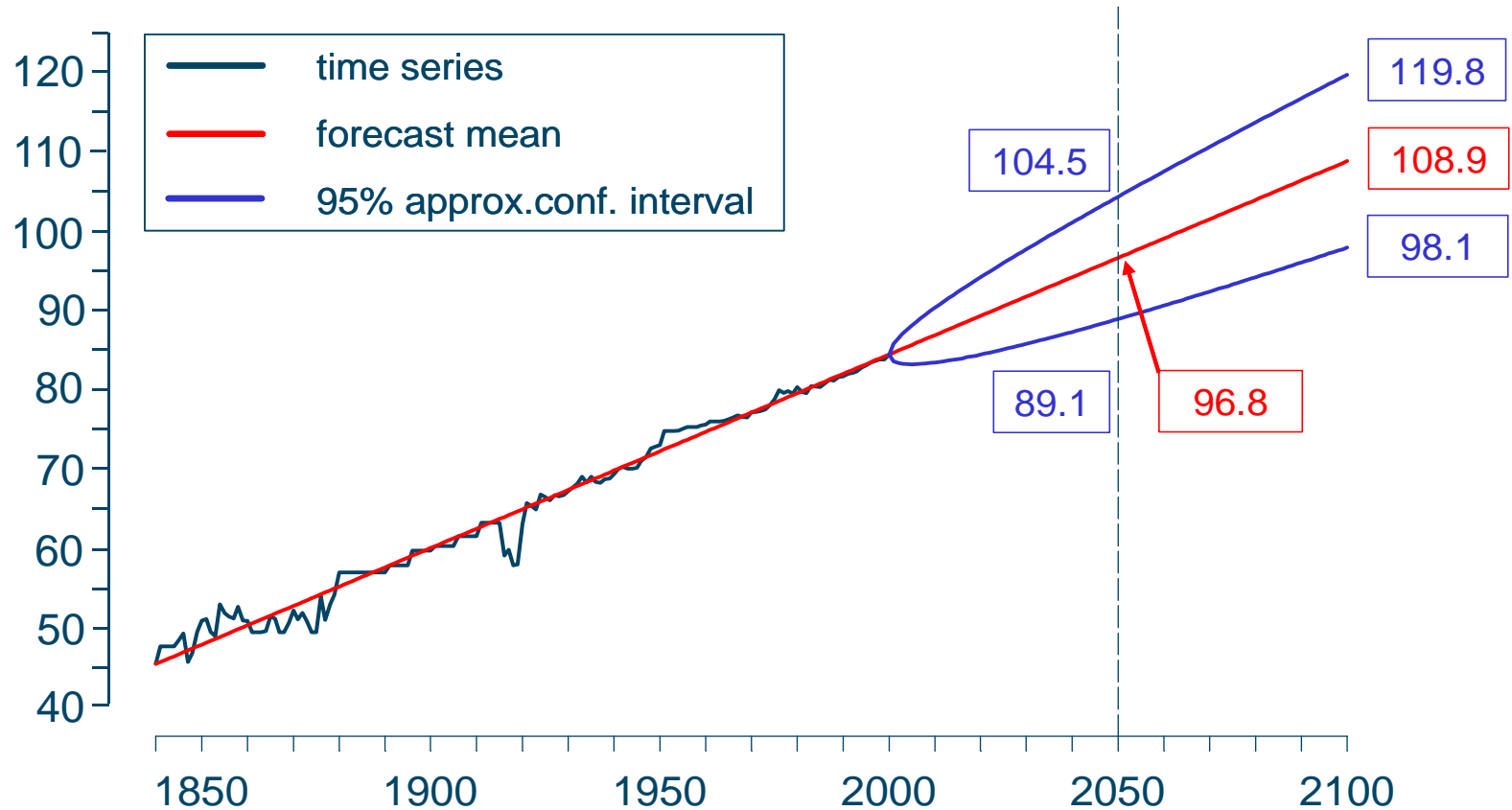


Population Counts

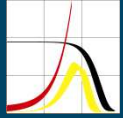
Country	Ages: 80+			Ages: 90+			Ages: 100+		
	1960	2000	Ann.Incr. in %	1960	2000	Ann.Incr. in %	1960	2000	Ann.Incr. in %
Austria	121,334	272,581	2.02	6,321	41,381	4.70	26	436	7.36
France	995,020	2,391,261	2.19	70,458	486,642	4.83	605	10,756	7.19
Germany (East)	346,747	574,264	1.26	16,978	100,191	4.44	51	1,213	7.92
Germany (West)	930,152	2,698,848	2.66	47,799	473,116	5.73	173	6,738	9.16
Italy	740,775	2,513,479	3.05	49,104	422,863	5.38	332	7,461	7.78
Japan	720,166	5,236,010	4.96	36,022	800,537	7.75	199	16,078	10.98
Sweden	152,380	478,089	2.86	11,172	73,040	4.69	95	1,206	6.35
USA	2,829,398	9,963,453	3.15	278,212	1,683,285	4.50	6,656	53,419	5.21
Σ	7,709,783	26,156,195	3.05	584,700	4,410,726	5.05	8,137	97,307	6.20



Projections and Forecasting

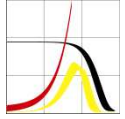


Forecasting female record life expectancy (up to 2100)
using a random walk with drift



Oldest age at which at least 50 percent of a birth cohort is still alive in seven large countries

Country	Birth Year							
	2000	2001	2002	2003	2004	2005	2006	2007
Canada	102	102	103	103	103	104	104	104
Germany	99	100	100	100	101	101	101	102
France	102	102	103	103	103	104	104	104
Italy	102	102	102	103	103	103	104	104
Japan	104	105	105	105	106	106	106	107
United Kingdom	100	101	101	101	102	102	103	103
USA	101	102	102	103	103	103	104	104

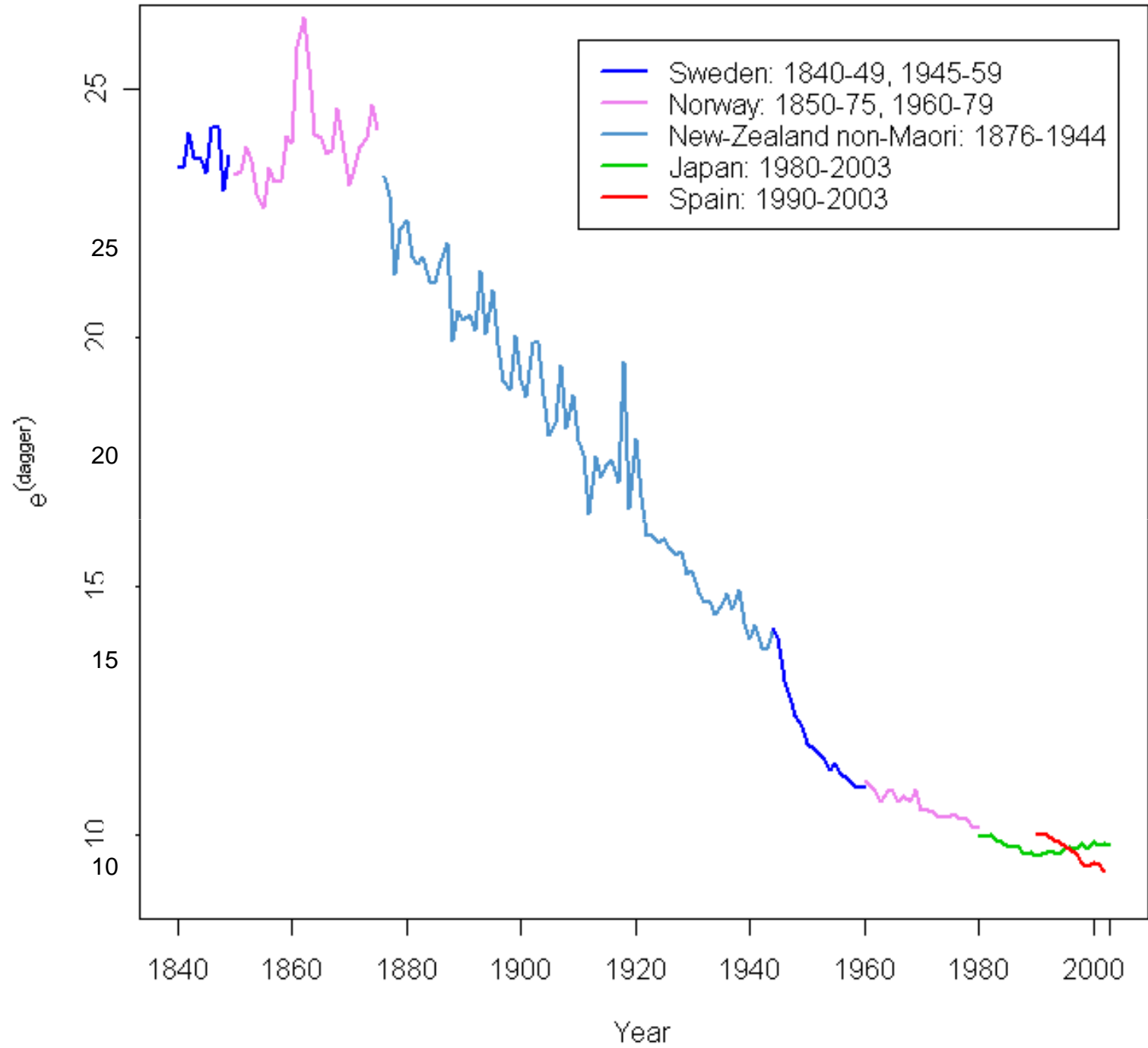
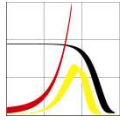


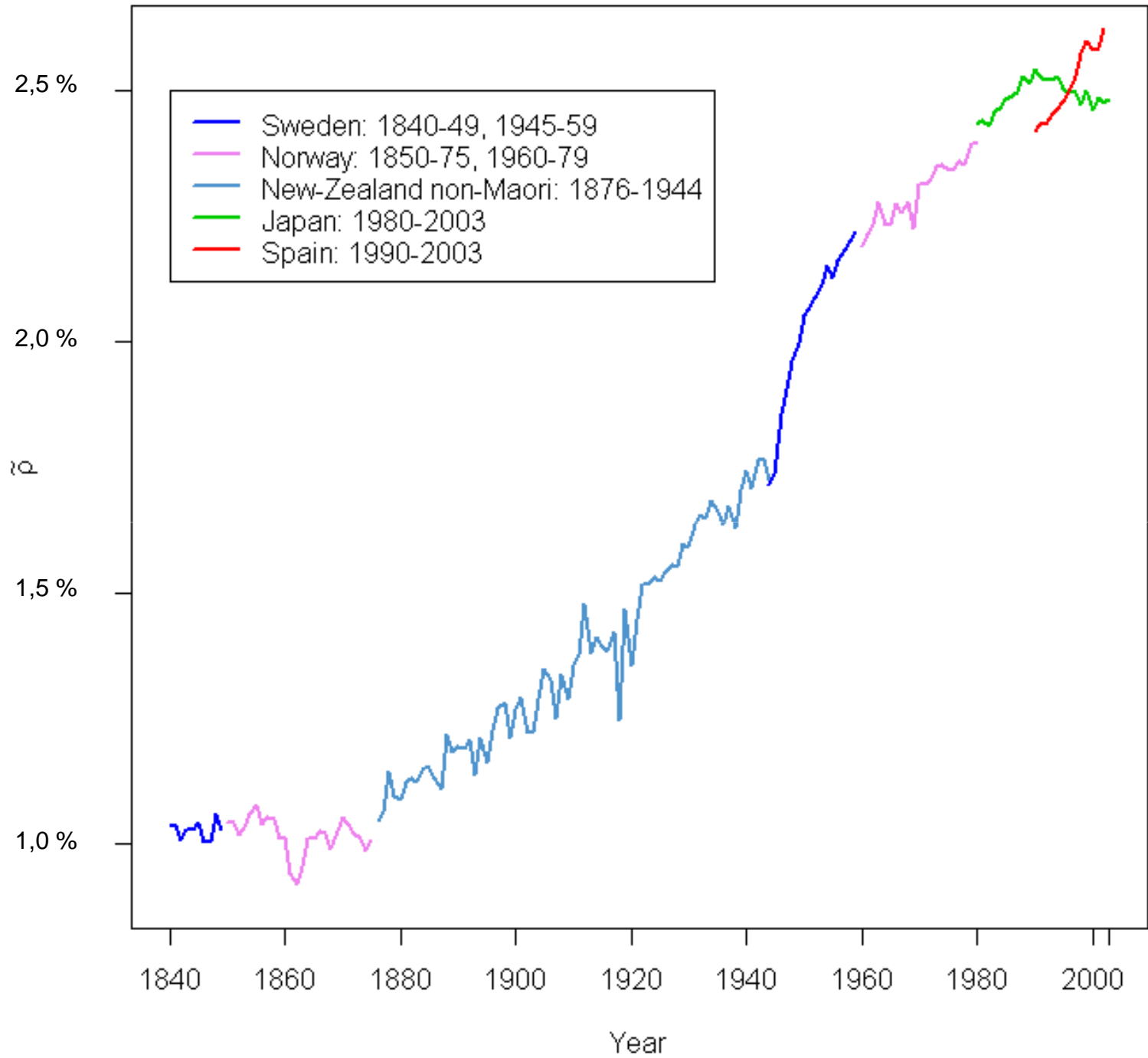
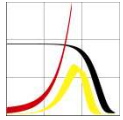
Decomposing Change in Life Expectancy

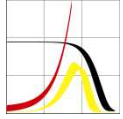
Why?

$$\frac{de_0}{dt} = \dot{e}_0 = \bar{\rho} e^{\dagger}$$

Year	\dot{e}_0	$\bar{\rho}$	e^{\dagger}
1840	0.25	1.0 %	25
2000	0.25	2.5%	10

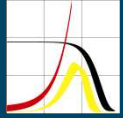






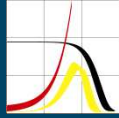
Future Progress

- Cancers, Alzheimer's, etc.
- Genetic medicine
- Regeneration and rejuvenation medicine
- Nanobots

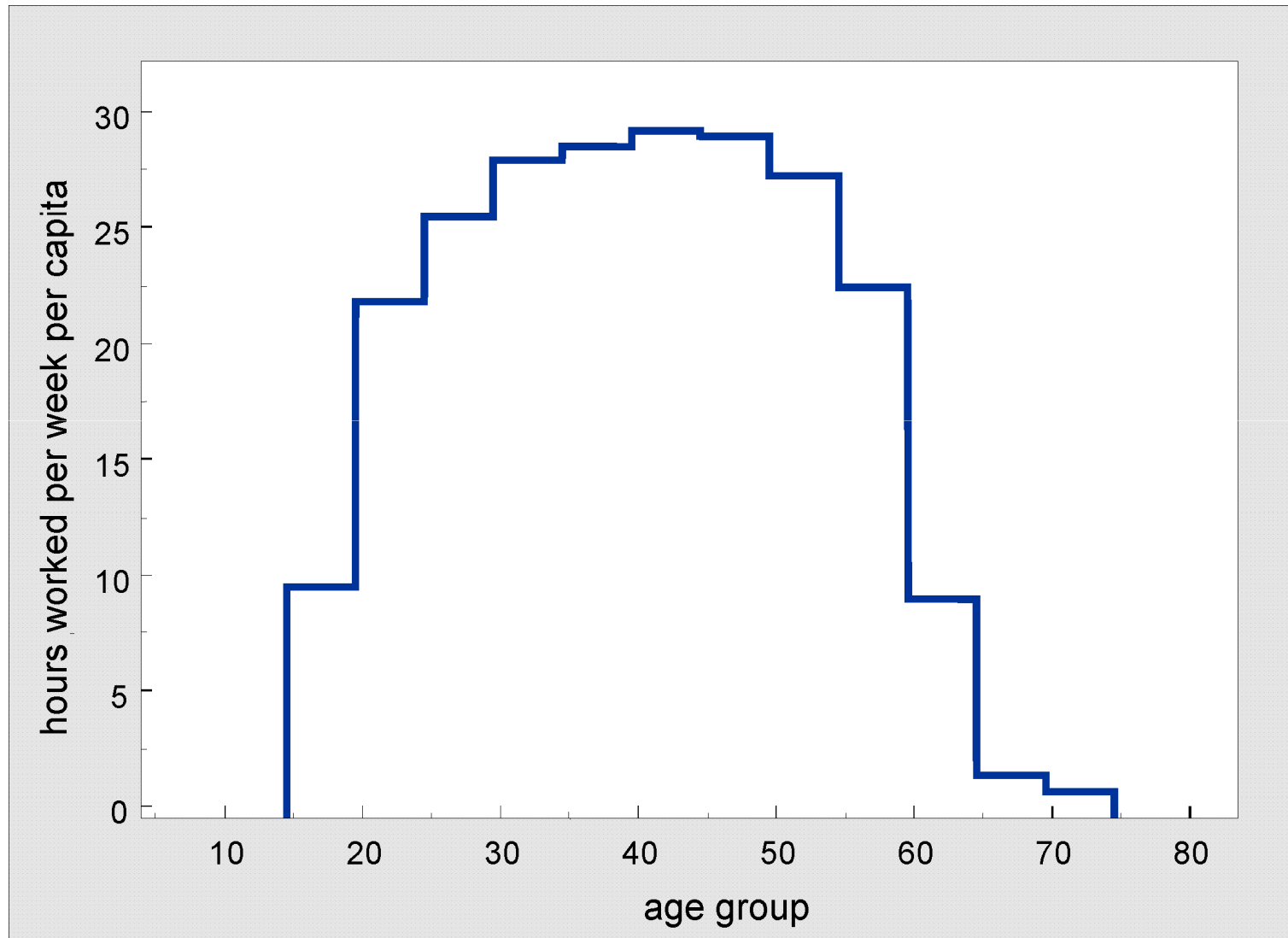


A New Work-Life-Balance

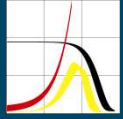
Country	R, nonworkers per worker			H, hours worked per week per capita		
	2005	2025	Change	2005	2025	Change
Germany	1.27	1.47	16%	16.28	14.95	-8%
Denmark	0.97	1.12	15%	17.46	16.11	-8%
France	1.43	1.69	18%	15.09	13.63	-10%
Italy	1.59	1.86	17%	15.19	13.48	-11%
Netherlands	1.01	1.20	19%	15.31	13.88	-9%
UK	1.09	1.19	9%	17.32	16.34	-6%
USA	1.09	0.99	-9%	18.71	18.29	-2%



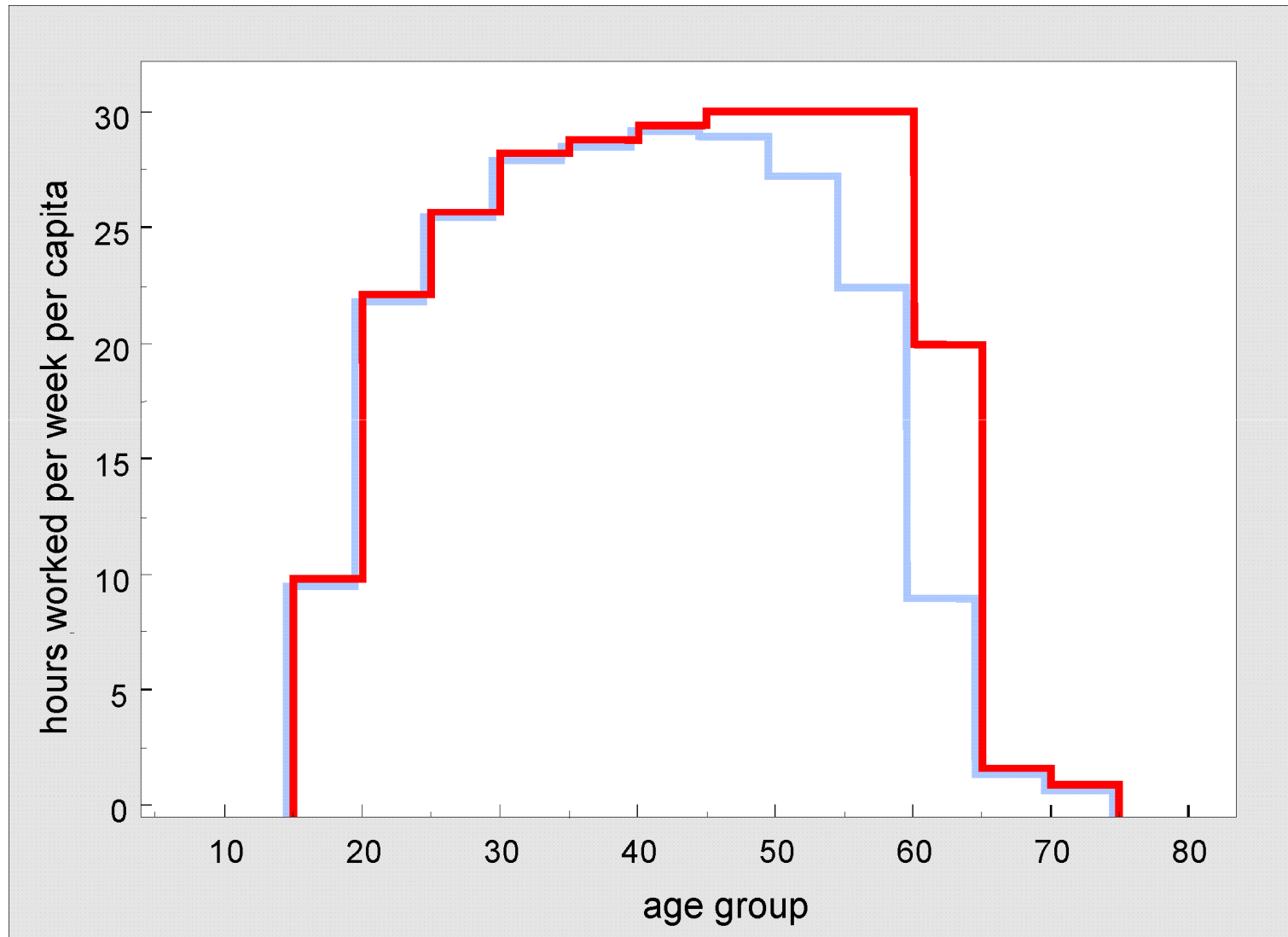
A New Work-Life-Balance



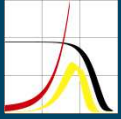
Vaupel & Loichinger, Science 2006



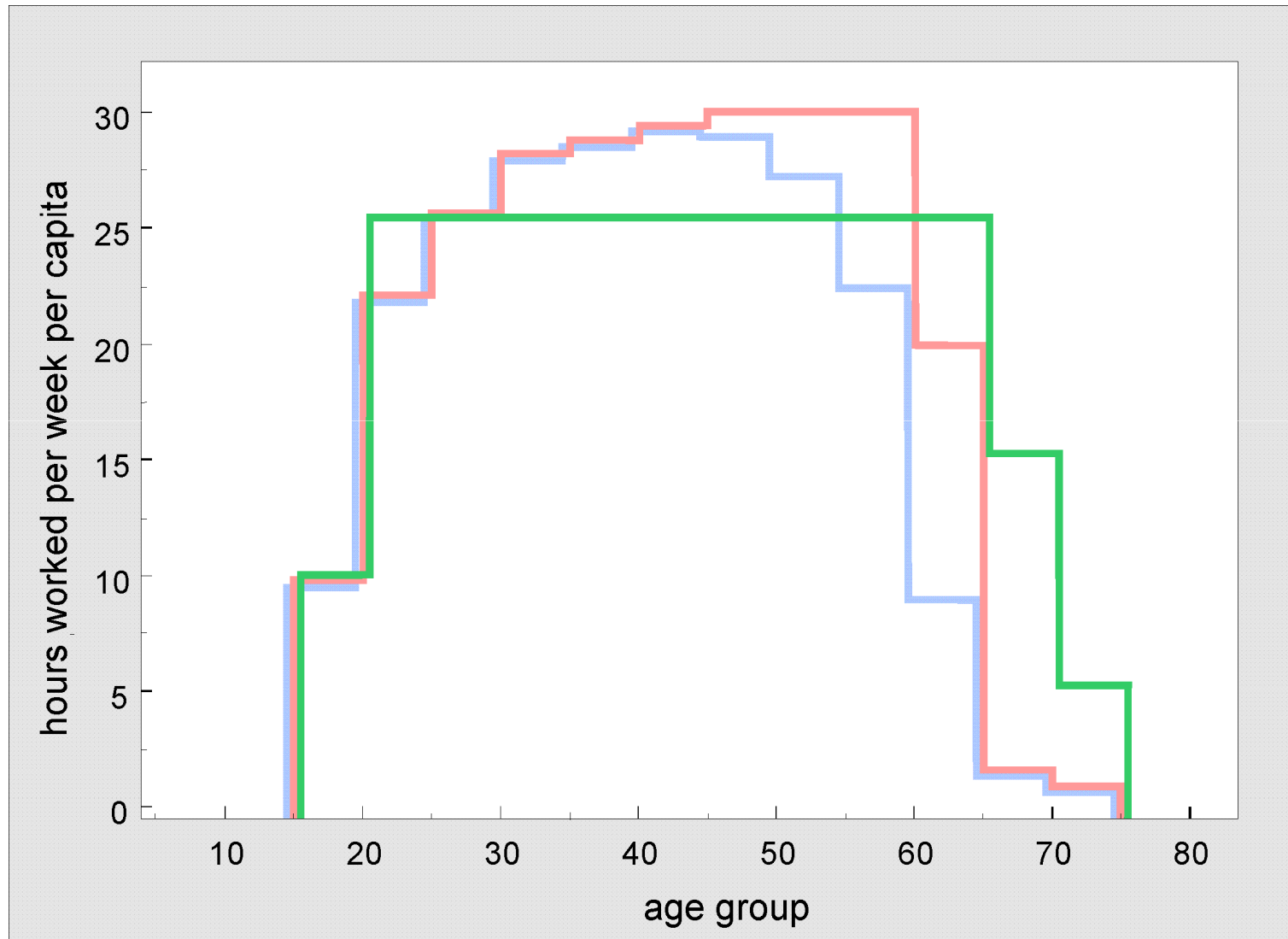
A New Work-Life-Balance



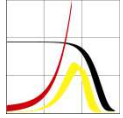
Vaupel & Loichinger, Science 2006



A New Work-Life-Balance

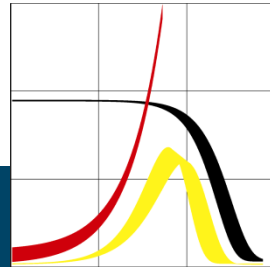


Vaupel & Loichinger, Science 2006

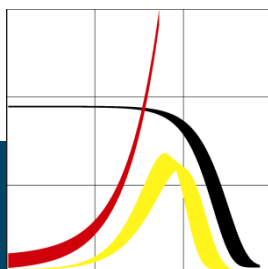


Summary: Prospects for the 21st Century

- Live longer and longer
- Live healthier at any specific age
- Postpone disability to later ages
- Work more years but
fewer hours per year



Comments or Questions?



Max Planck Institute for Demographic Research

www.demogr.mpg.de