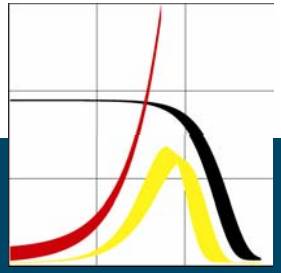
Max Planck Institute for Demographic Research

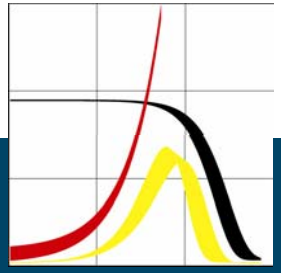


The Plasticity of Longevity

James W. Vaupel

Max Planck Institute for Demographic Research

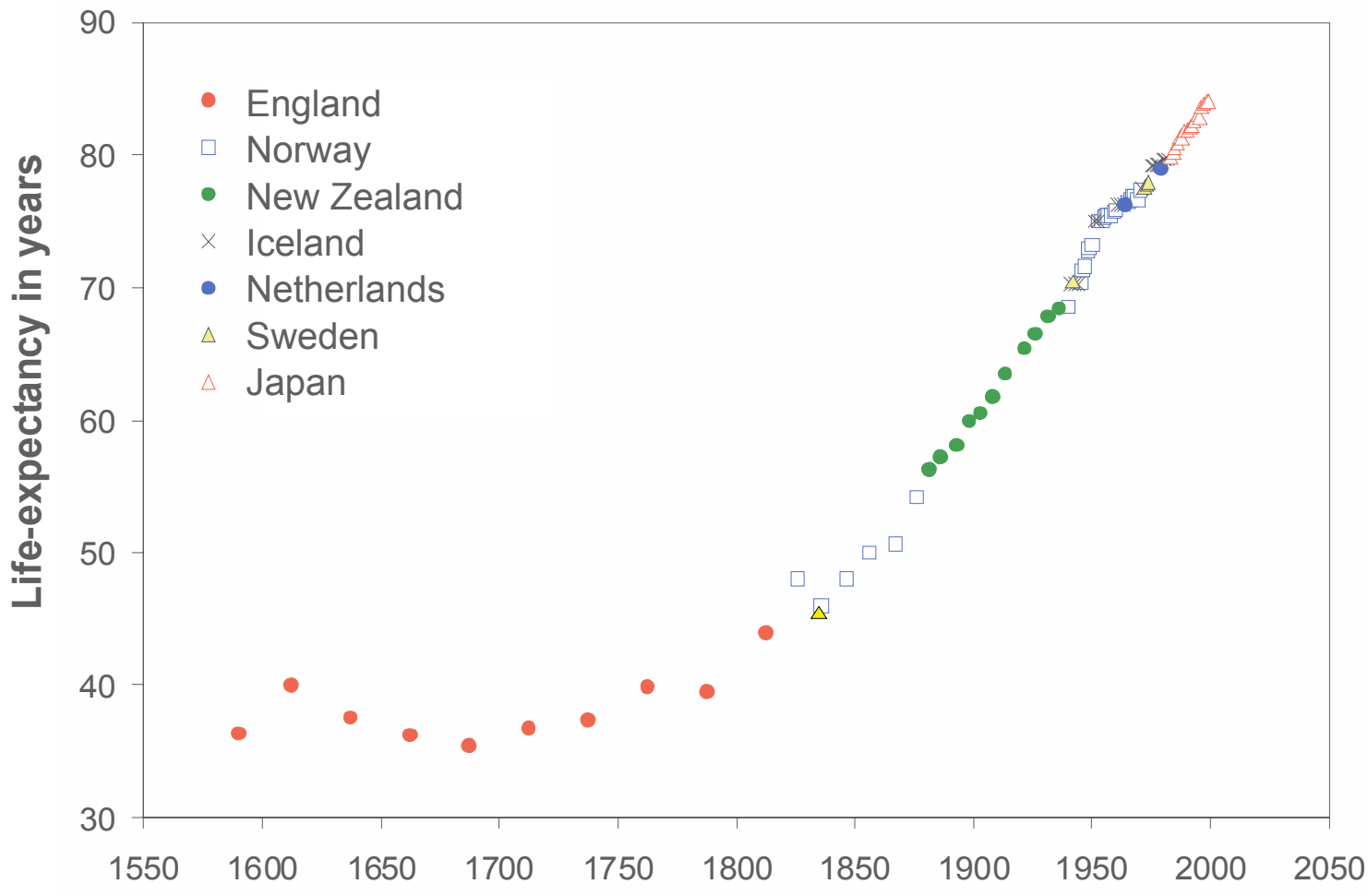
Laboratory of Survival and Longevity



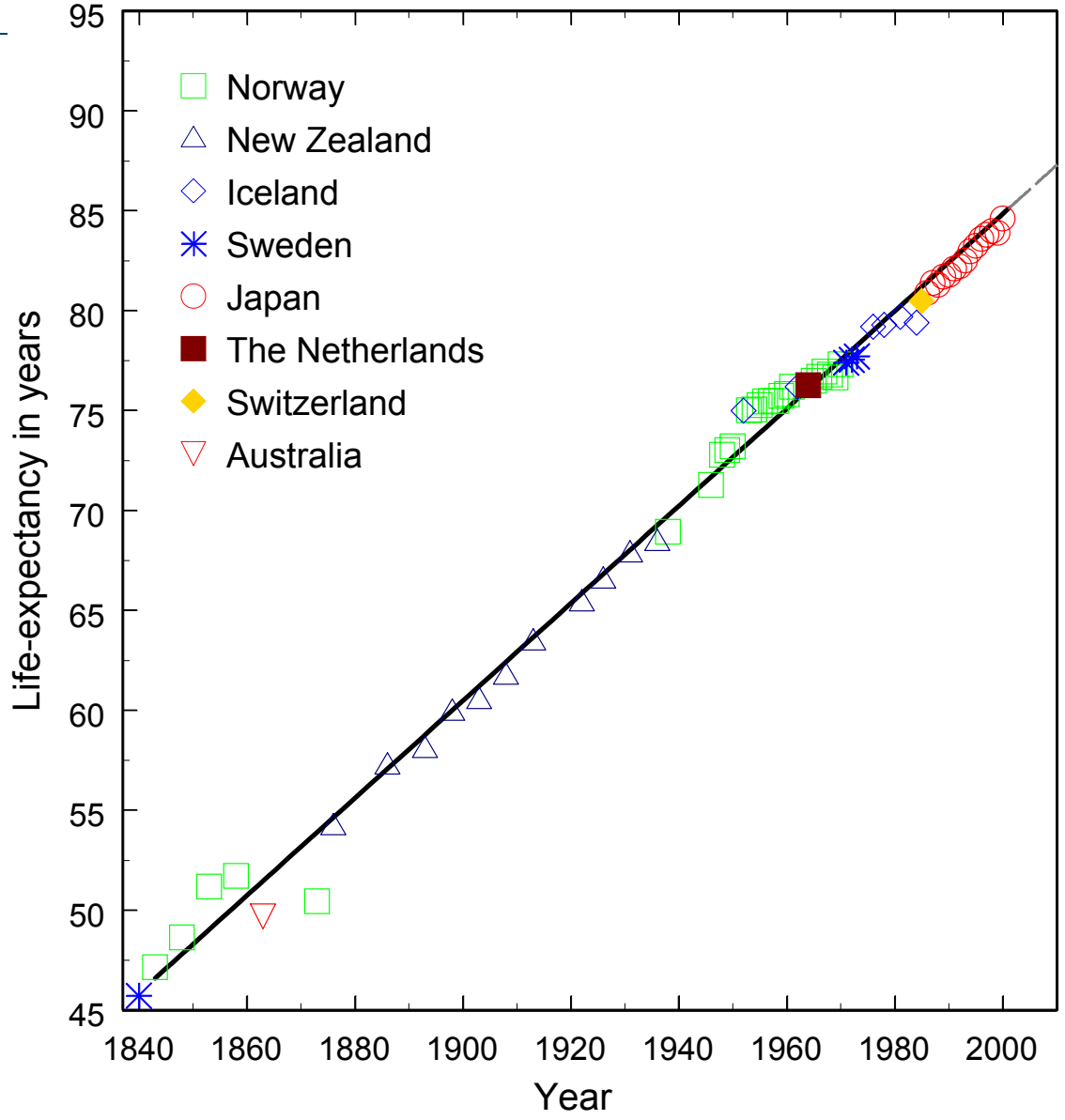
Part 1:

The Plasticity of Human Life Expectancy

Three Key Research Priorities for NIA



Oeppen & Vaupel, Science 2002



Oeppen & Vaupel, Science 2002

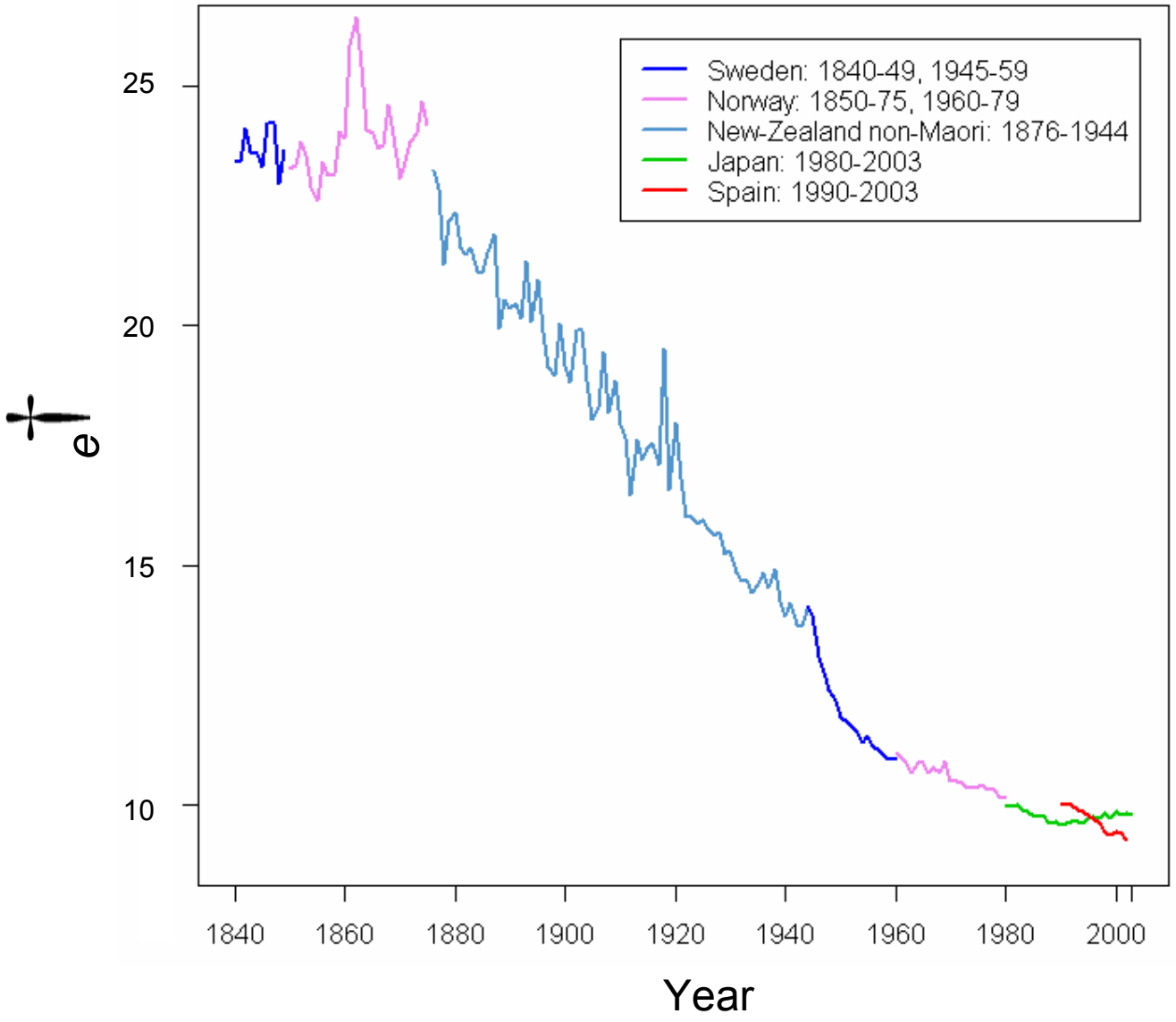
Decomposing Change in Life Expectancy

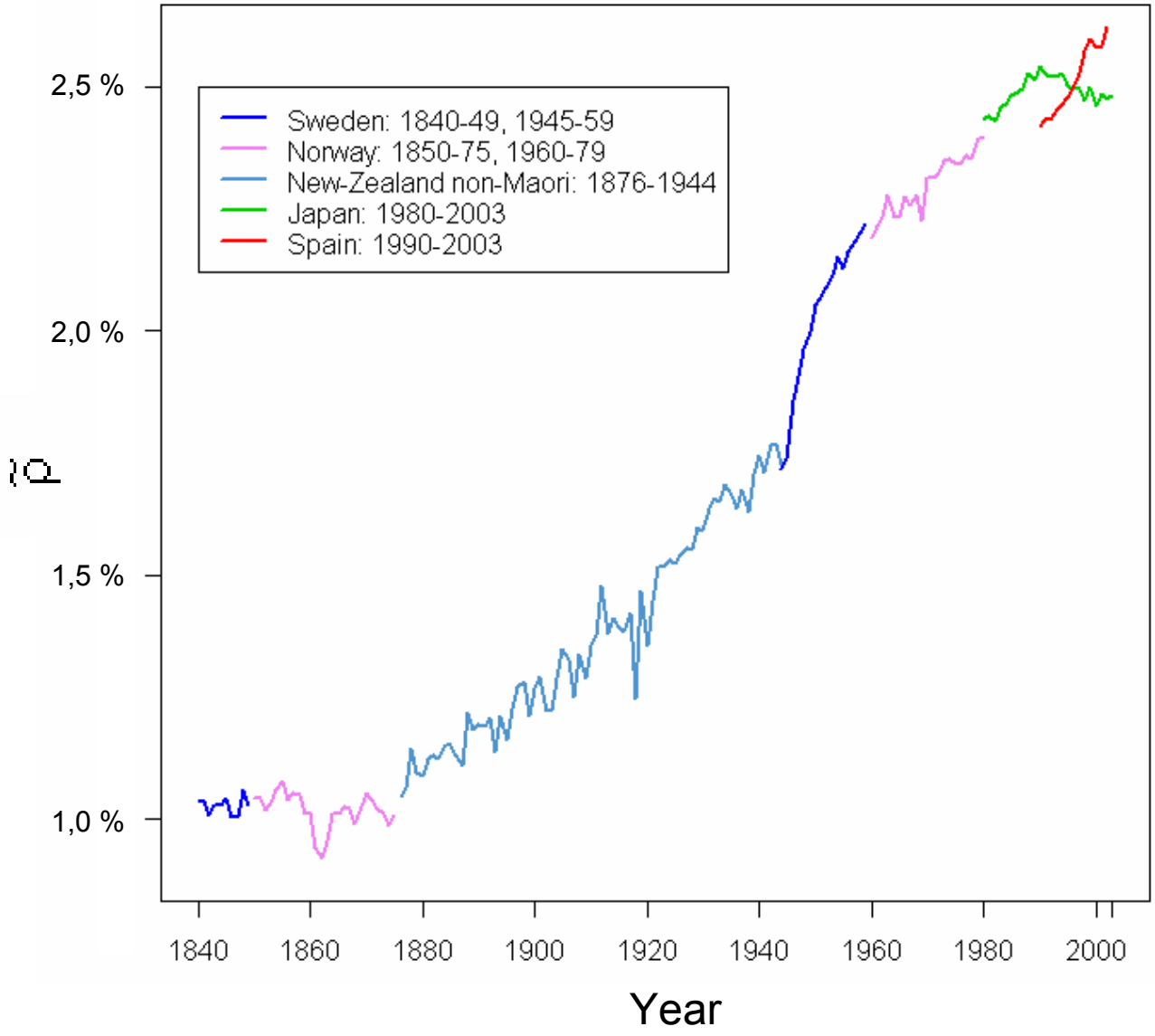
Why?

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

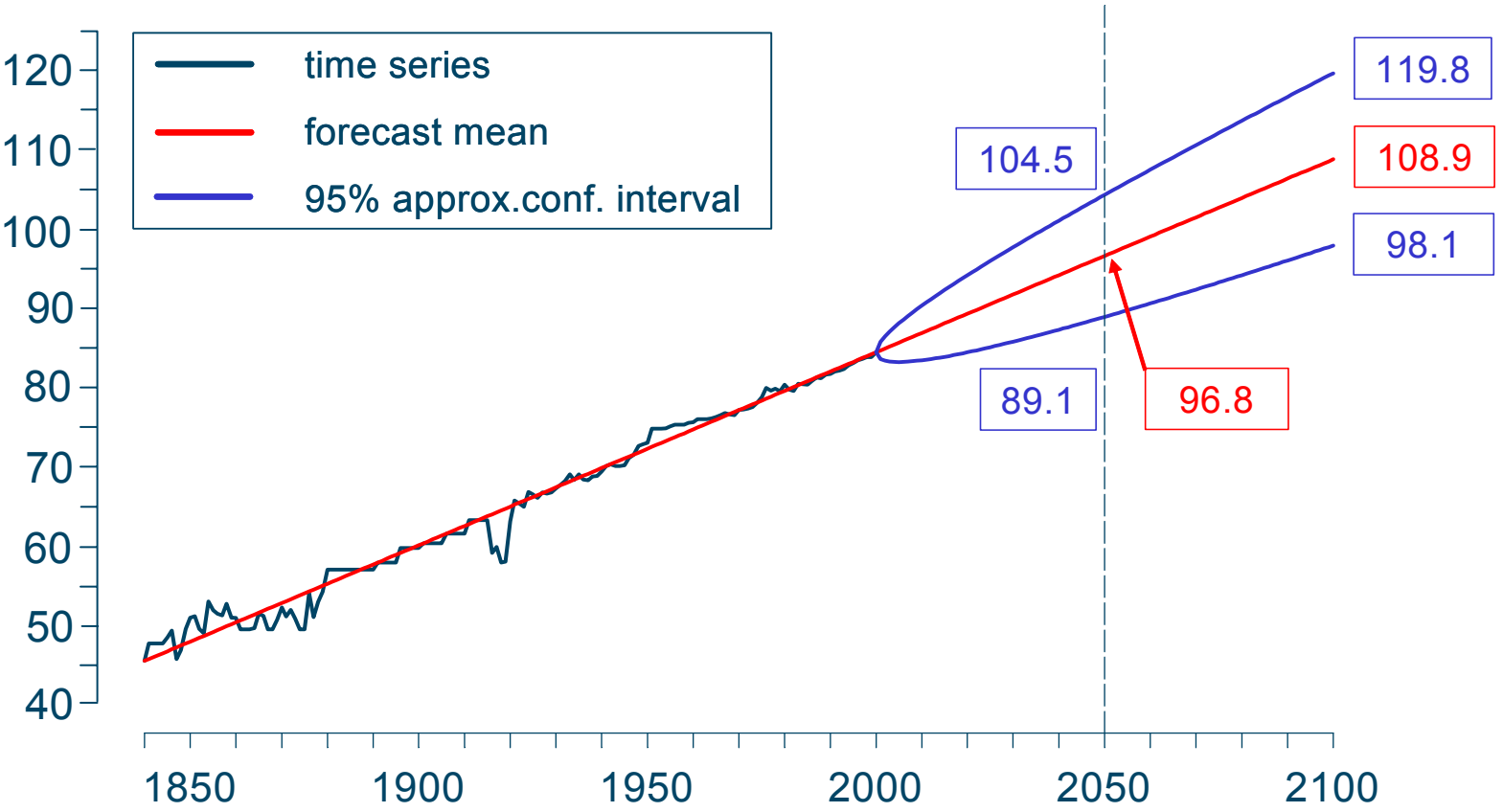
Year	$\dot{e}_0$	$\bar{\rho}$	$e^{\dagger}$
1840	0.25	1.0 %	25
2000	0.25	2.5%	10

Oeppen & Canudas Romo, Demography 2004


Sweden: 1840-49, 1945-59
Norway: 1850-75, 1960-79
New-Zealand non-Maori: 1876-1944
Japan: 1980-2003
Spain: 1990-2003
25
20
15
10
e
1840
1860
1880
1900
1920
1940
1960
1980
2000
Year


Sweden: 1840-49, 1945-59
Norway: 1850-75, 1960-79
New-Zealand non-Maori: 1876-1944
Japan: 1980-2003
Spain: 1990-2003
2,5 %
2,0 %
1,5 %
1,0 %
IQ
1840
1860
1880
1900
1920
1940
1960
1980
2000
Year

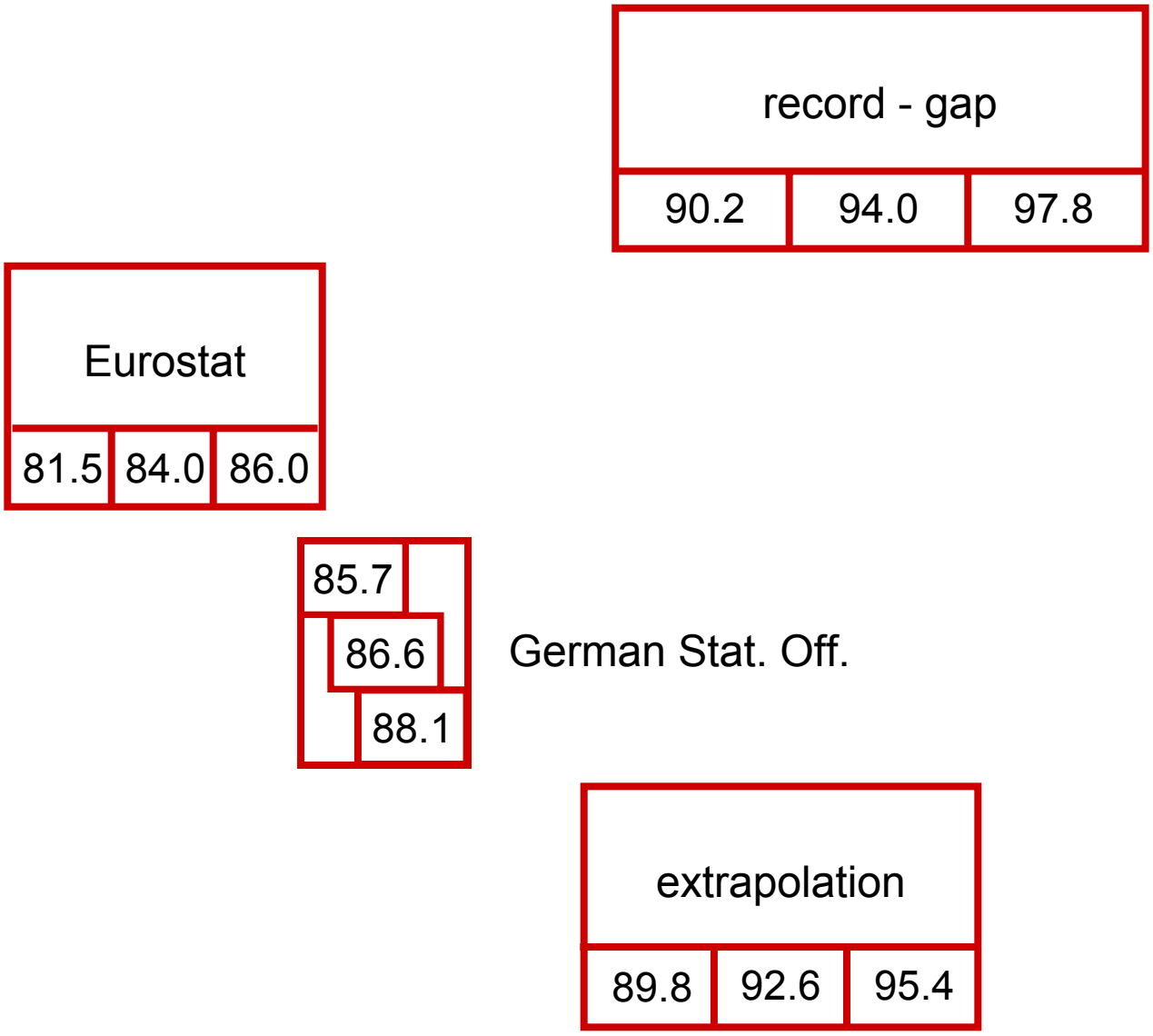
Random walk with drift

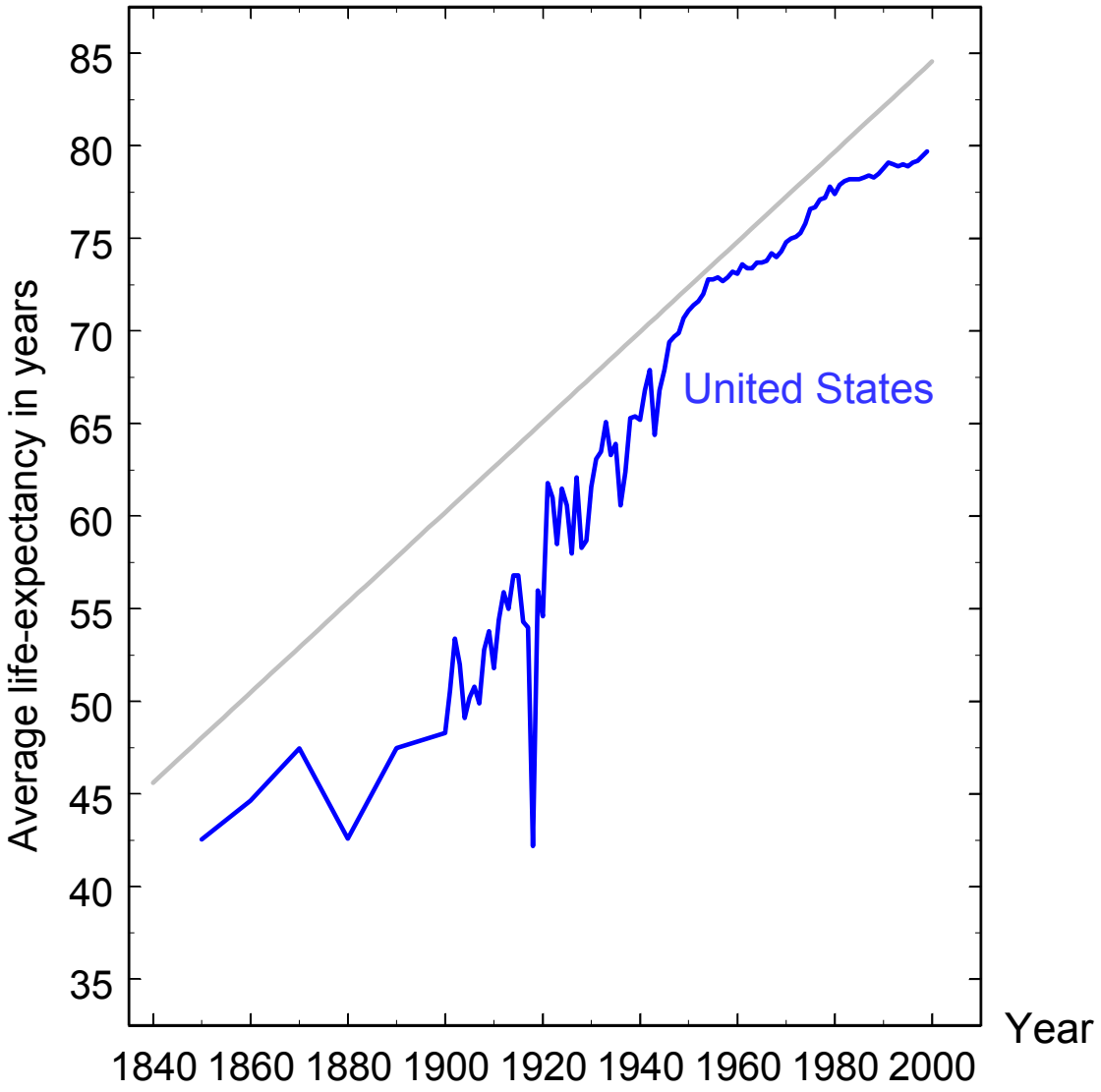


Forecasting female record life expectancy (up to 2100)

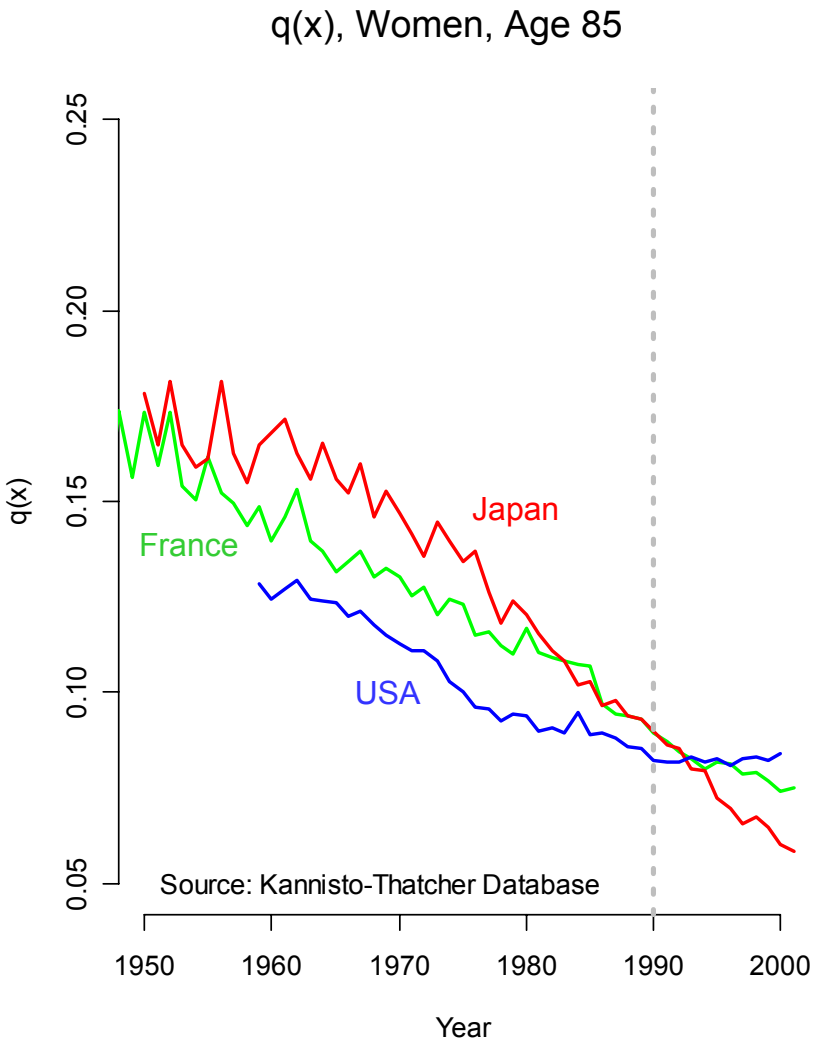
using a random walk with drift

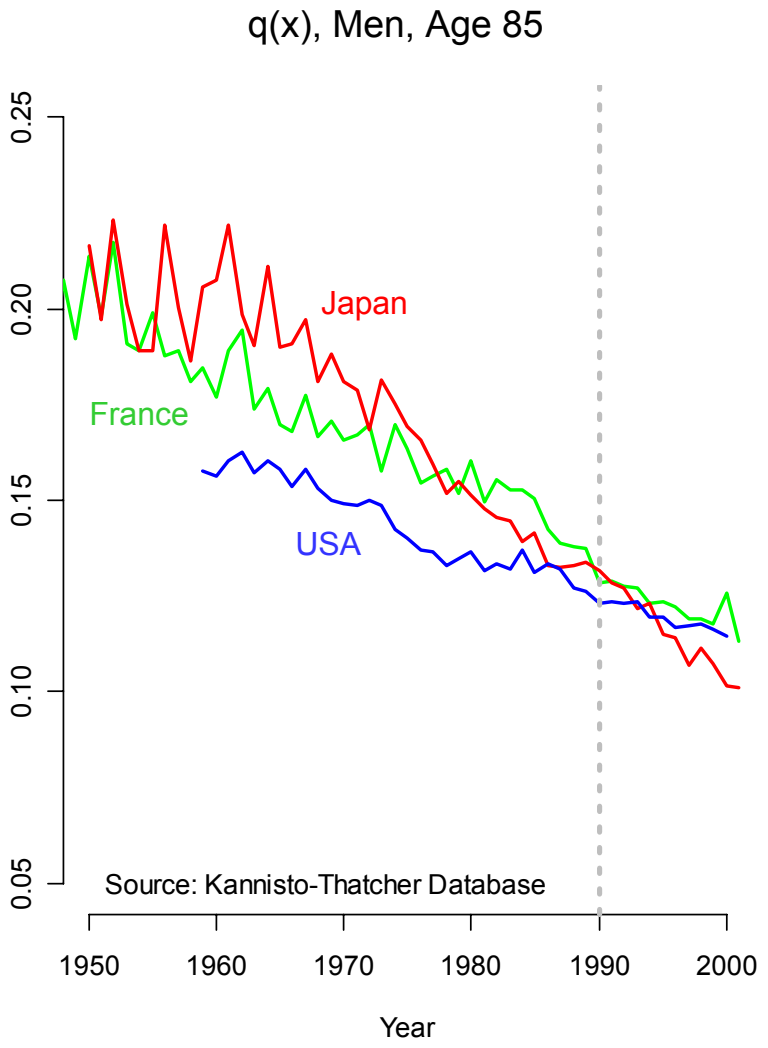
Comparison projections German females (2050)





Oeppen & Vaupel, Science 2002


q(x), Women, Age 85
q(x)
0.25
0.20
0.15
0.10
0.05
Japan
France
USA
Source: Kannisto-Thatcher Database
1950
1960
1970
1980
1990
2000
Year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1950
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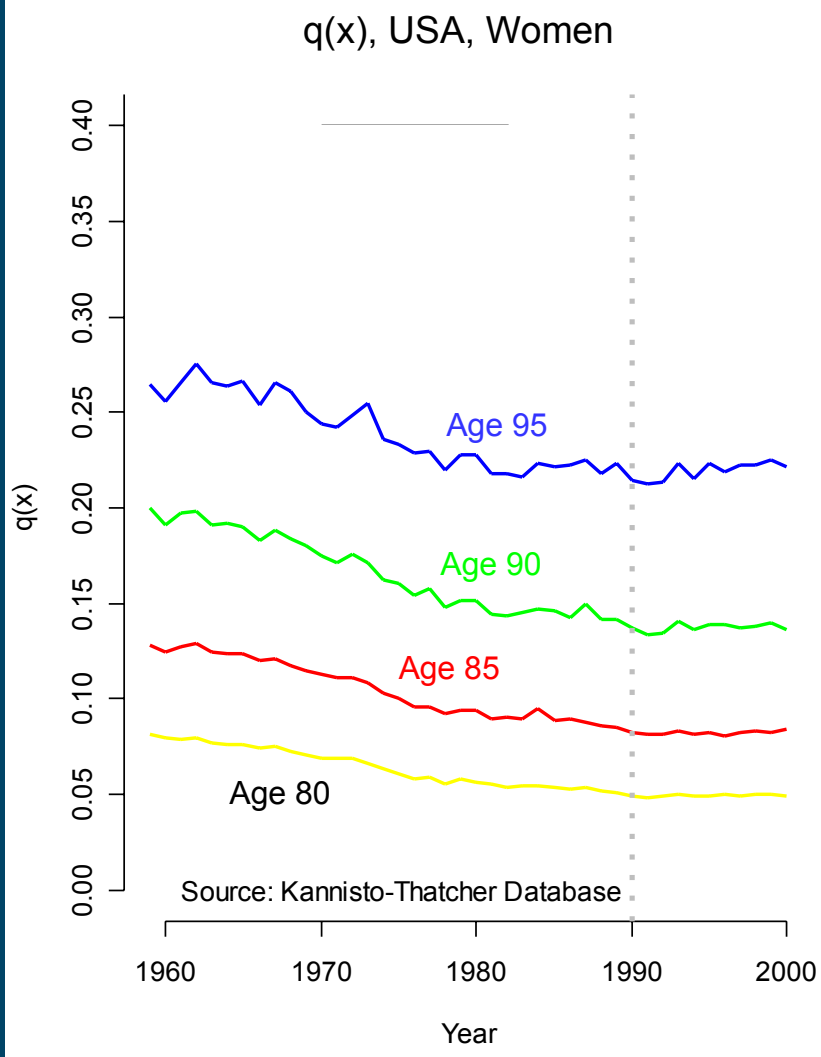
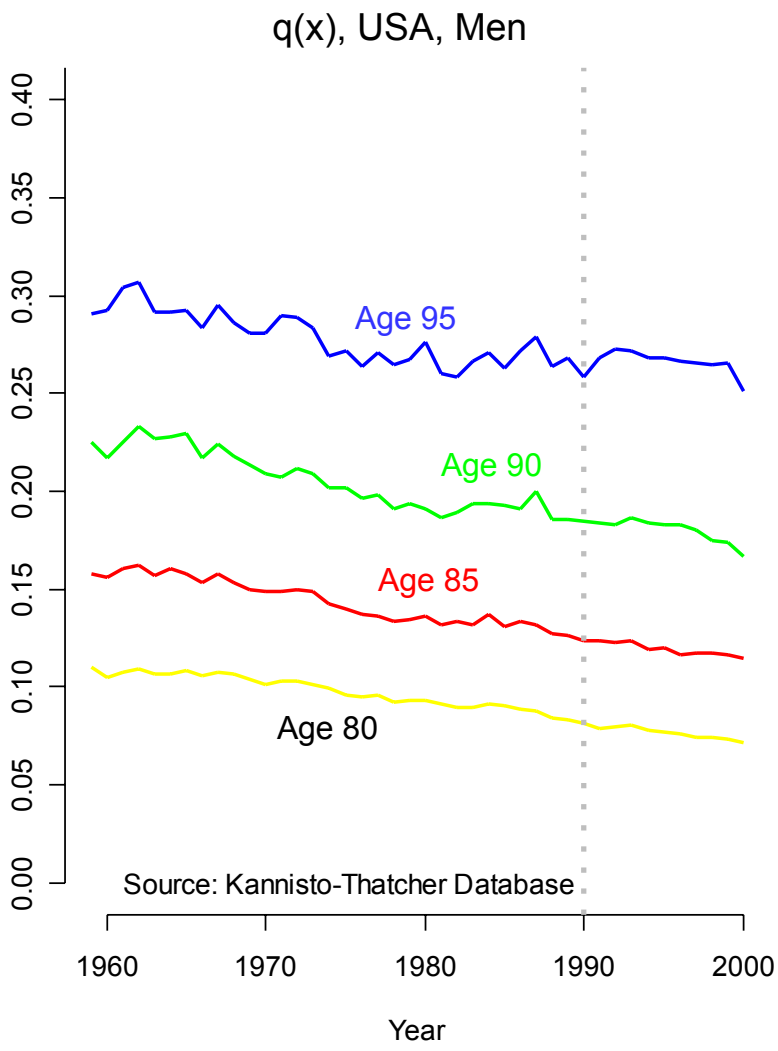
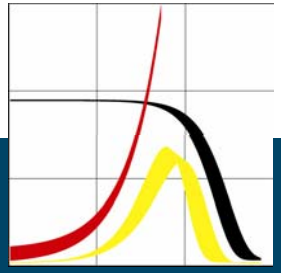
Year


q(x), USA, Women
q(x)
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
Age 95
Age 90
Age 85
Age 80
Source: Kannisto-Thatcher Database
1960
1970
1980
1990
2000
Year


q(x), USA, Men
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
Age 95
Age 90
Age 85
Age 80
Source: Kannisto-Thatcher Database
1960
1970
1980
1990
2000
Year

Country	$e^{\dagger}$ around 2002
Russia	12.68
Latvia	11.40
USA	11.40
Lithuania	11.36
Hungary	11.12
Bulgaria	10.58
Japan	9.79
Austria	9.59
Sweden	9.41
Switzerland	9.33
Spain	9.26



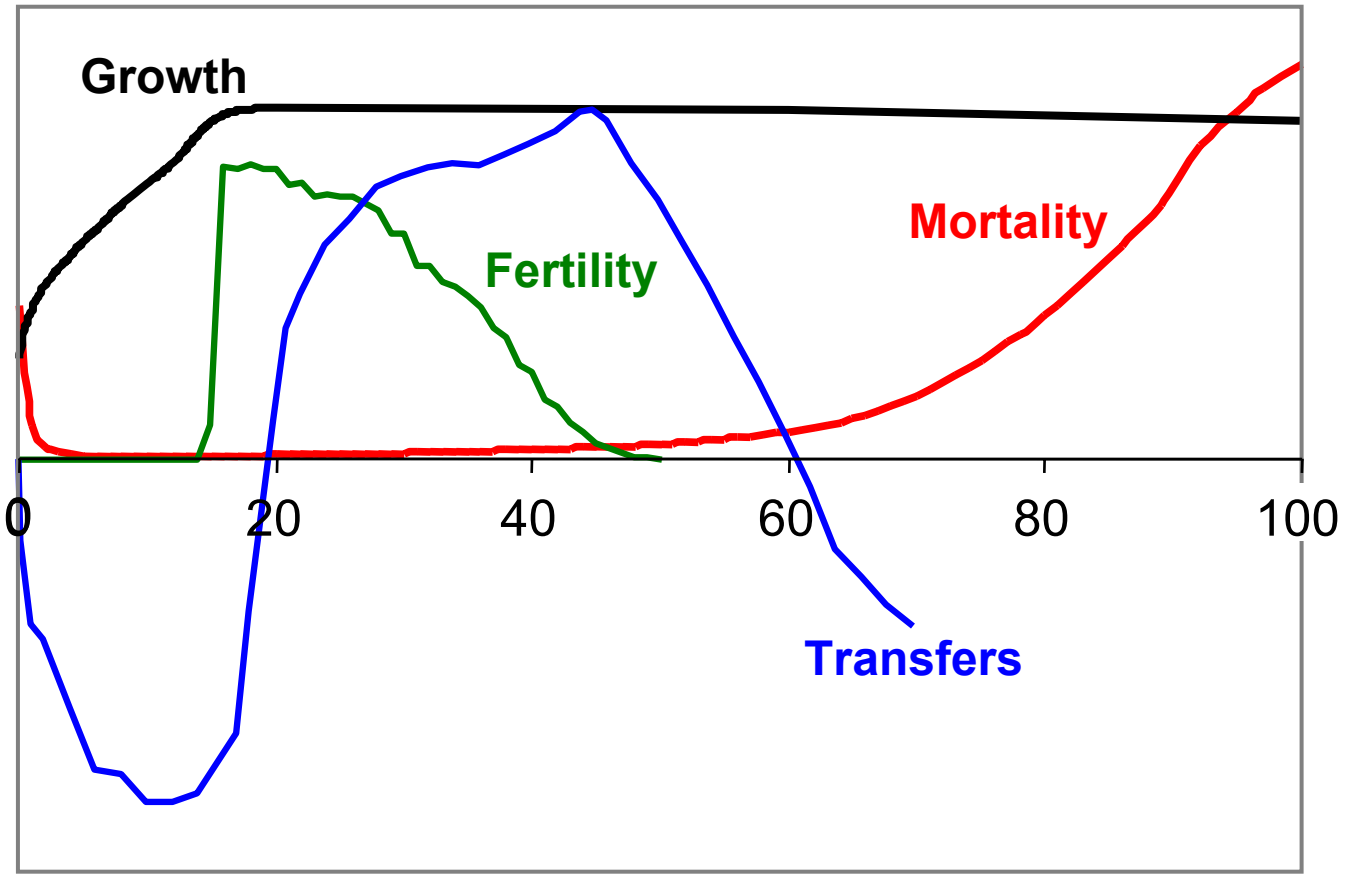
Part 2:

The Plasticity of Longevity within and across Species

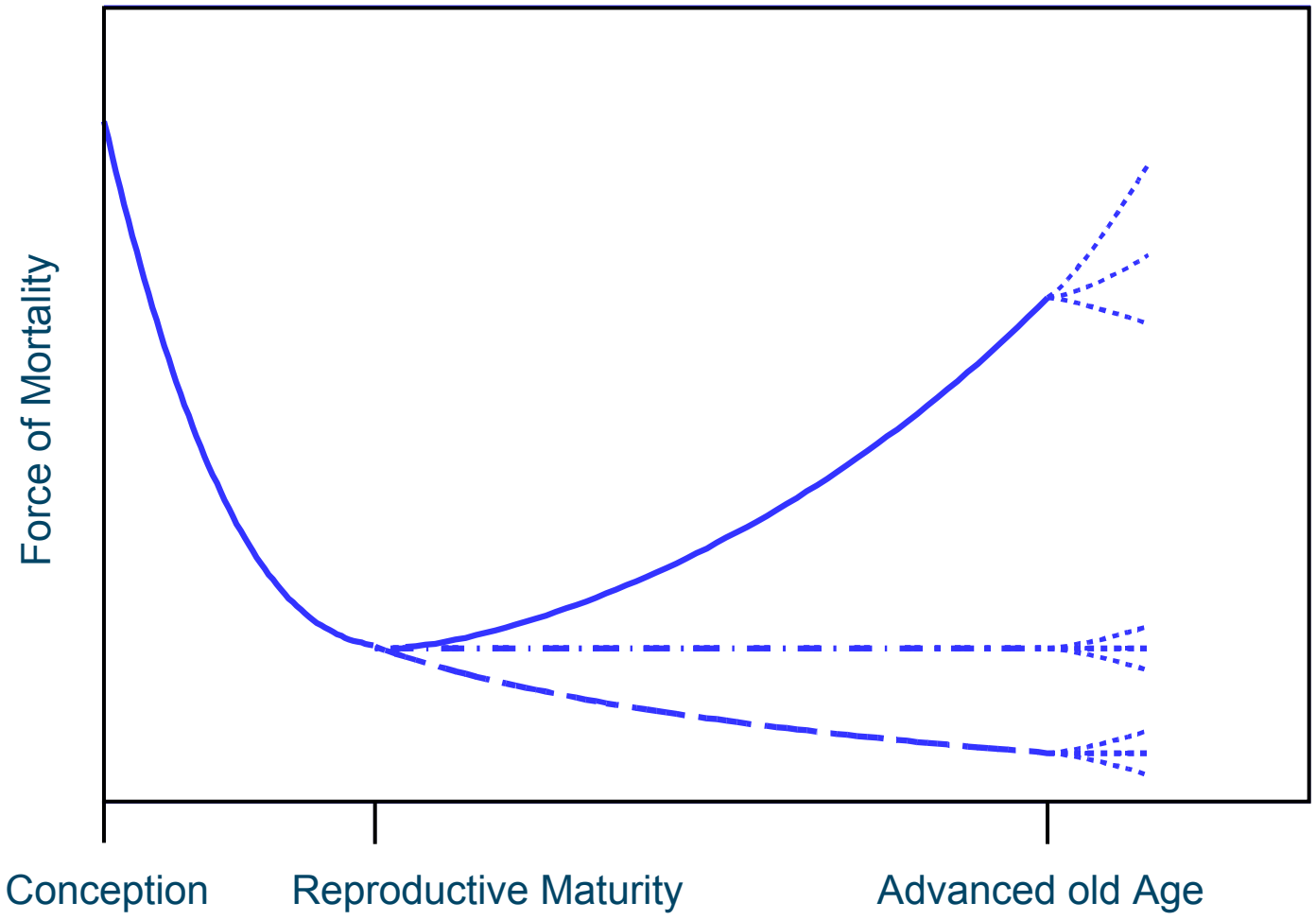
Evolutionary Demography

(“Evodemo”)

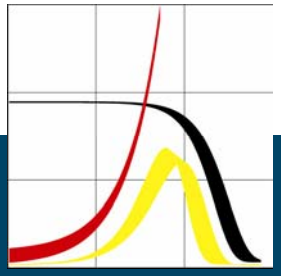
Trajectories of Human Mortality, Fertility, Growth and Transfers



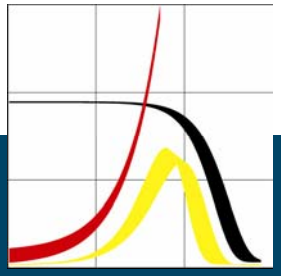
Trajectories of Mortality



Vaupel et al., Theoretical Population Biology 2004; Baudisch, PNAS 2005



Comments or Questions?



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