



SAPIENZA
UNIVERSITÀ DI ROMA

Department of Statistical Sciences

Si fa presto a dire invecchiamento...

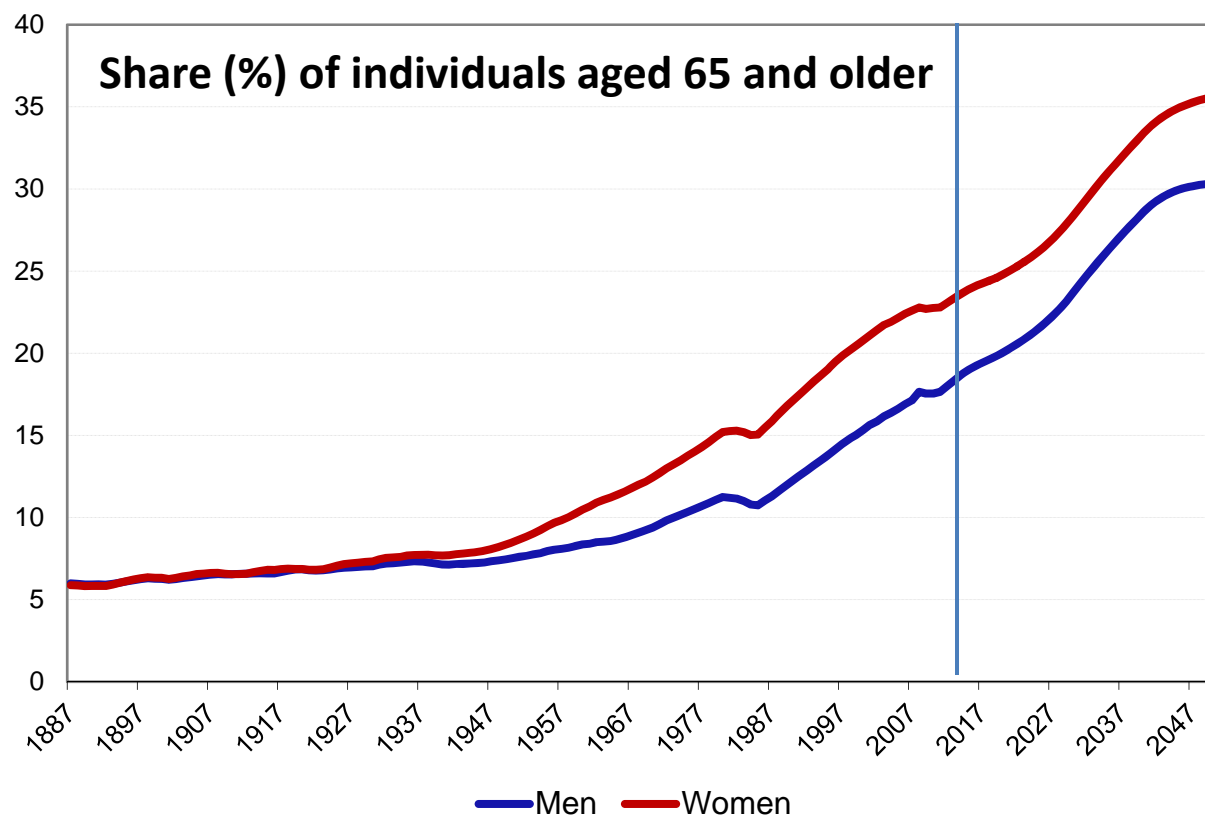
***Riflessioni sul concetto di invecchiamento demografico
e sulle sue misure***

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Elena Demuru



An unprecedented phenomenon...

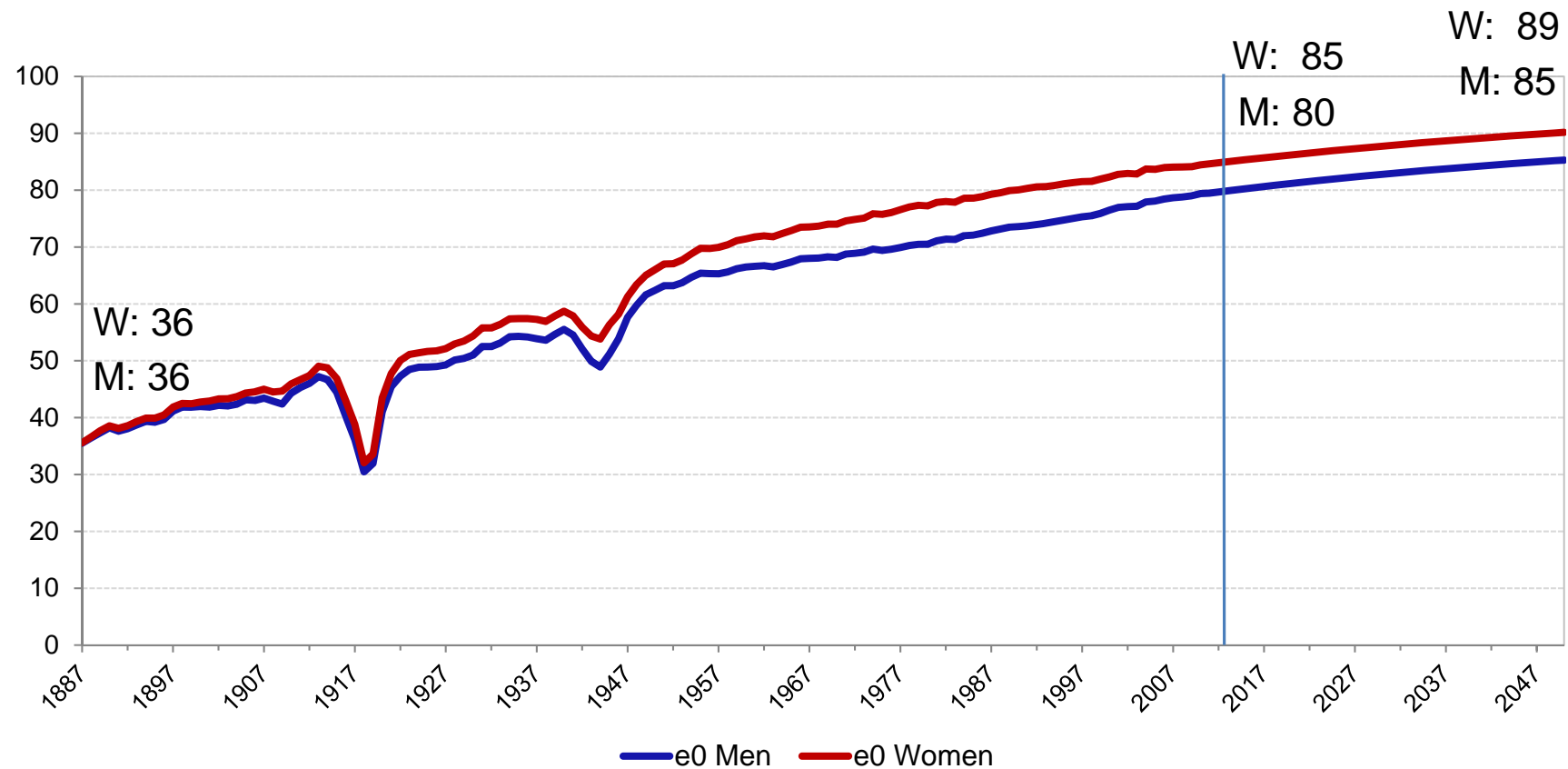


Calendar Years	>=65 years old (%)	
	M	W
1887	6	6
1900	7	7
1950	8	10
2000	18	23
2016	19	24
2050	31	37

...which affects in many ways the social and economic structure and individual life

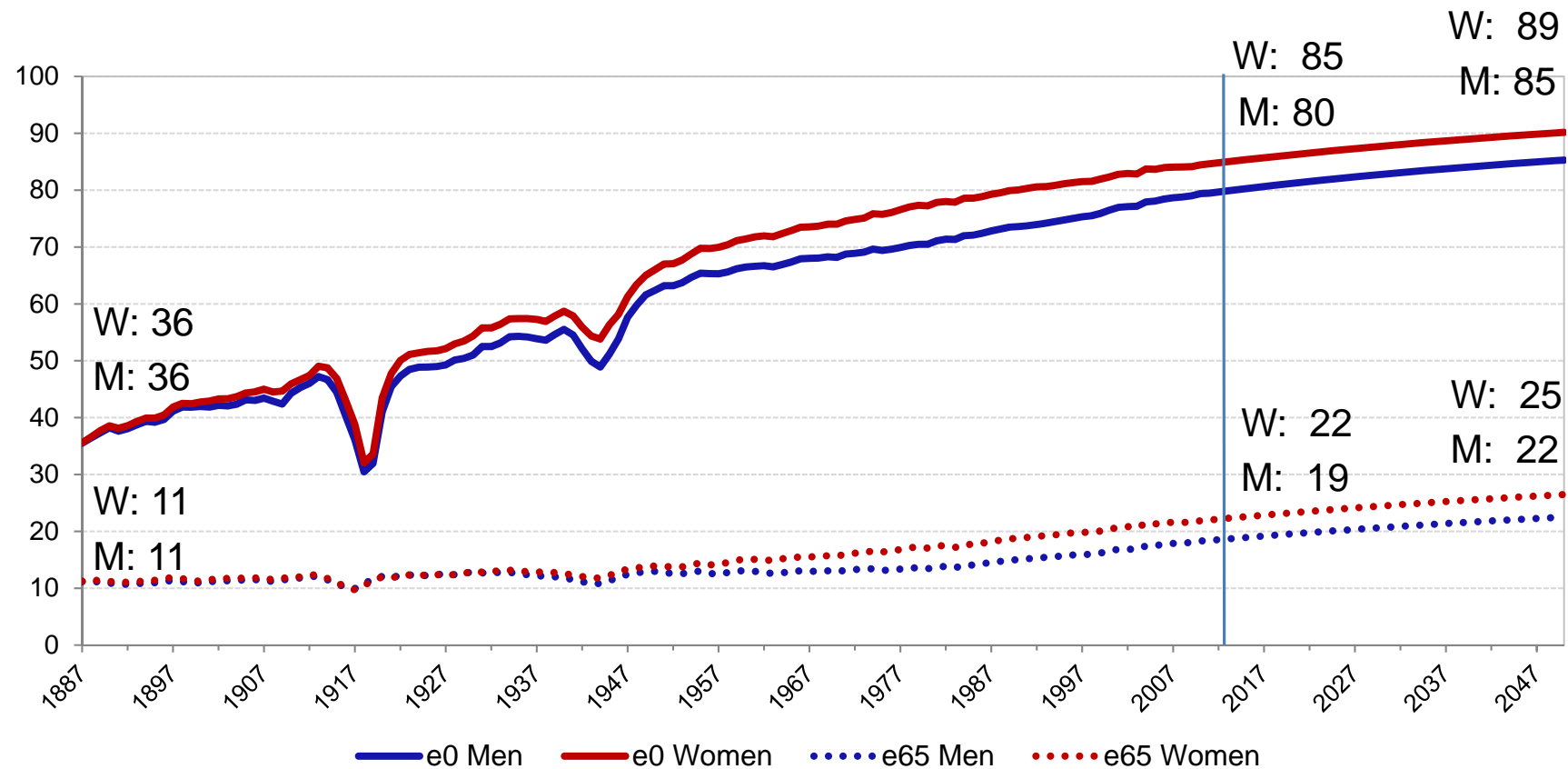


A major driver: the “longevity revolution”





A major driver: the “longevity revolution”





Population ageing: challenge or opportunity?

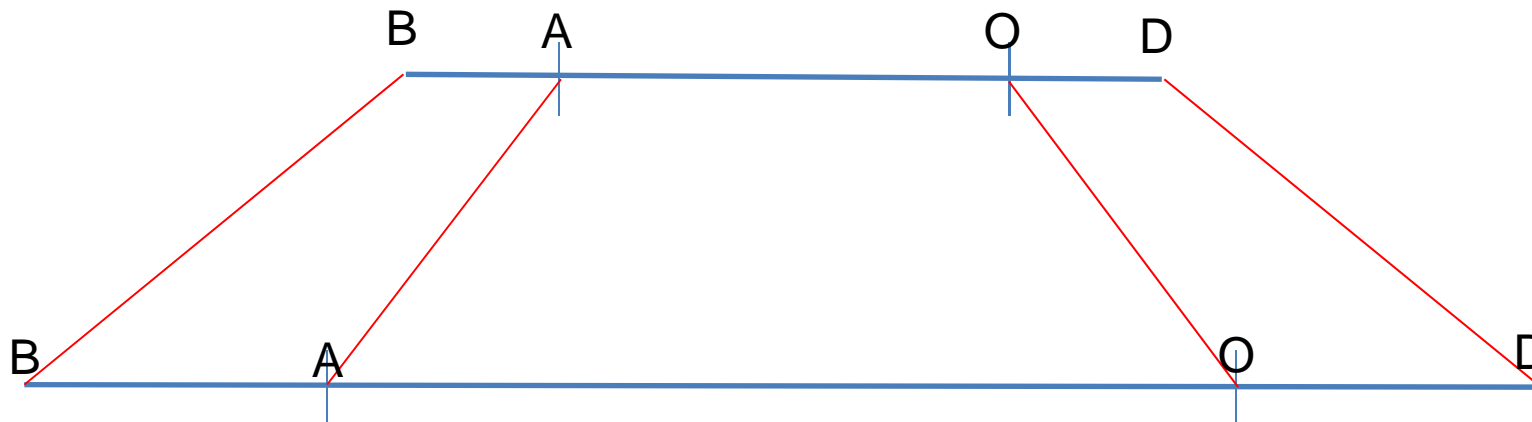
- A longer life the greater ambition of mankind:
– **micro success, macro failure ?**
- Is longevity **sustainable** ?
- Can we **ensure well-being** of all currently (4-5) coexisting generations ? Can we find **new equilibria** to adapt the social and economic organization to an ageing population structure ?
- Our concept of **demographic ageing** and the **measures we use** are still appropriate to the **longer and healthier life** of elderly persons? What are the relationships between **health and demographic ageing?**



What consequences the increased longevity had on the timing of the life cycle?

The proportional rescaling hypothesis (Lee & Goldstein 2003)

BA: Childhood
AO: Adulthood
OD: Old-age



Hp: Every life stage expands in proportion to increased life expectancy



Barriers to proportional rescaling

Life cycle changes are not necessarily linked to increased longevity

- the role of technological development, economic and social organization, cultural expectations

Many barriers to proportional rescaling:

- **Biological**: increased longevity is not a result of evolutionary forces, so **biological thresholds remained substantially unchanged** (the length of time children are physically dependent on their parents; sexual maturity; menopause)
- **Behavioral**: people choose to allocate increasing time to leisure, adding years to the post working period
- **Institutional**: incentives for early retirement have amplified the impact of population ageing on pension system



Another hypothesis to evaluate the impact of increased longevity on life cycle

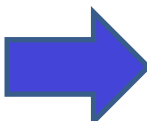
The repetition hypothesis: Increased longevity produces the repetition of some relevant phase of the life cycle instead of adding years at every stage

- Remarriage and second families; different period of schooling; several working careers; several residential settlement; ..

This hypothesis **better reflects reality** for some dimensions of the life cycle **but**



Until now, no shared hypothesis about the impact of longer life on individual life course

The default solution when measuring population ageing: the added years have been simply added to the last phase of life  **a longer older age**

Do other strategies exist?



Individual and population ageing

- *“Population ageing differs from the ageing of an individual. People who survive a year, grows older a year. Population can grow younger if certain conditions are met” (Ryder, 1975)*
- He proposed to measure age in term of **years remaining until death**, instead of years elapsed since birth: a dynamic **old-age threshold defined by 10 years of Remaining Life Expectancy (RLE)**
- **Much criticism:** Arbitrariness of the limit of 10 yrs of RLE
- **A great merit ! A dynamic old-age threshold depending on longevity**



Retrospective and prospective age

Many years later, **Sanderson and Scherbov (2005)** resumed the same approach: the **prospective age**

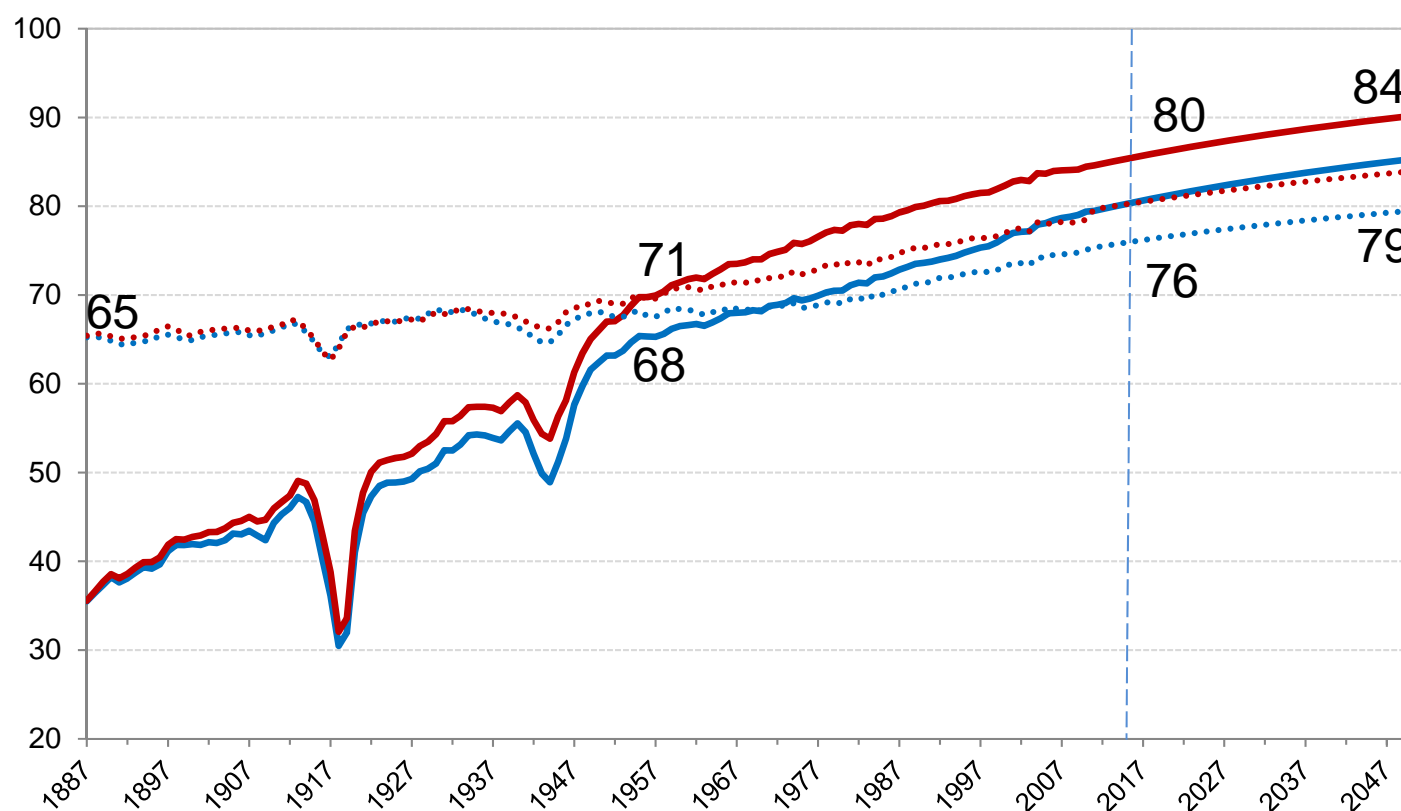
Male, 2014		Standard: Male, 1990			Standard: Male, 1980		
Retrospective age	ex	Prospective age	Retrospective age	ex	Prospective age	Retrospective age	ex

					57.1	57	18.98	
						58	18.24	
		59.5	59	19.31		59	17.50	
			60	18.56				
			61	17.81				
			62	17.08				
			63	16.37				
64	19.70		64	15.67				
65	18.91							
66	18.12							

Retrospective age of 65 in 2014 corresponds to a prospective age of **59.5** (standard 1990 life table) and of **57.1** (standard 1980)



Prospective old-age thresholds: age having a RLE = 11 yrs Italy 1887-2050



Age at which the RLE equals that observed for people aged **65 years in 1887** (i.e. 11 years for both M and W)

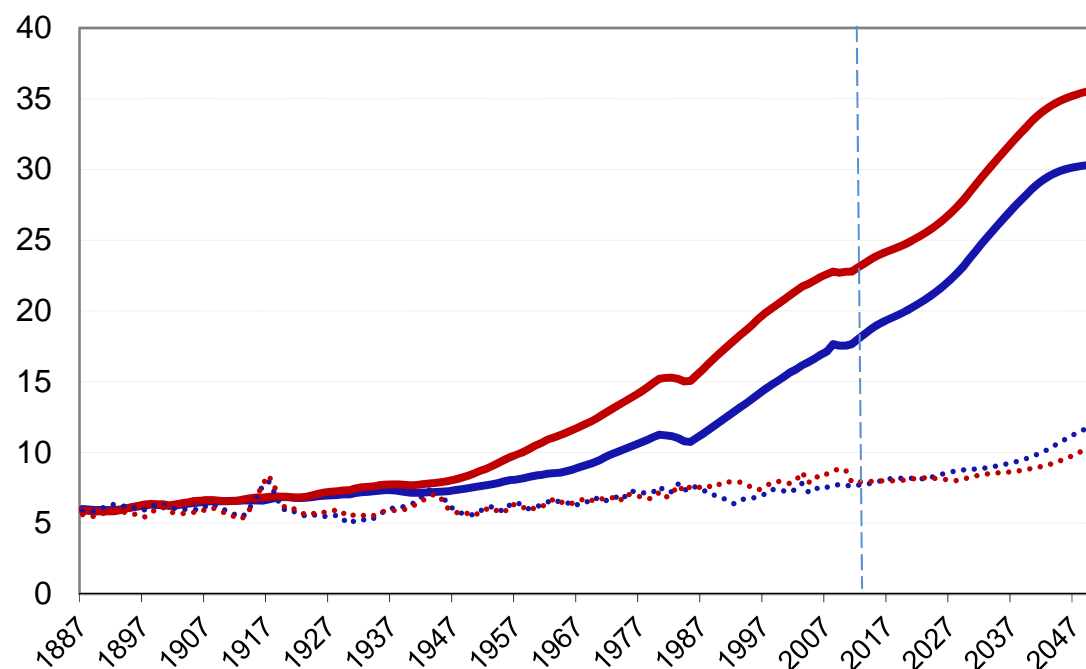
- LE M
- LE W
- ⋯ x^{RLE=11 yrs} M
- ⋯ x^{RLE=11 yrs} W

To be comparable to a **65-year-old person of 1887**, an elderly person of today should be **76 (M) or 80 (W) yrs old**



A different image of population ageing

Share of the elderly persons (%):
a comparison between conventional and prospective old-age threshold (ref. 1887)



— Men of age ≥ 65 years old
— Women of age ≥ 65 years old
... Men of age \geq prospective old-age threshold
... Women of age \geq prospective old-age threshold

Years	% ≥ 65 years of age		% \geq prospective old-age threshold	
	Men	Women	Men	Women
1887	6	6	6	6
1900	6	6	6	6
1950	8	9	6	6
2000	15	< 21	7	8
2016	19	< 24	8	8
2050	31	< 37	12	> 11



Adjusting the dynamic old-age threshold for health status

- **A major concern:** In which health conditions are lived the extra-years of life ?
- Not taking into account the changing health status of older people could lead to an **inaccurate estimate** of population ageing and its consequences
 - **Different socio and economic impact of rising longevity** depending on the health status in which the added years are lived



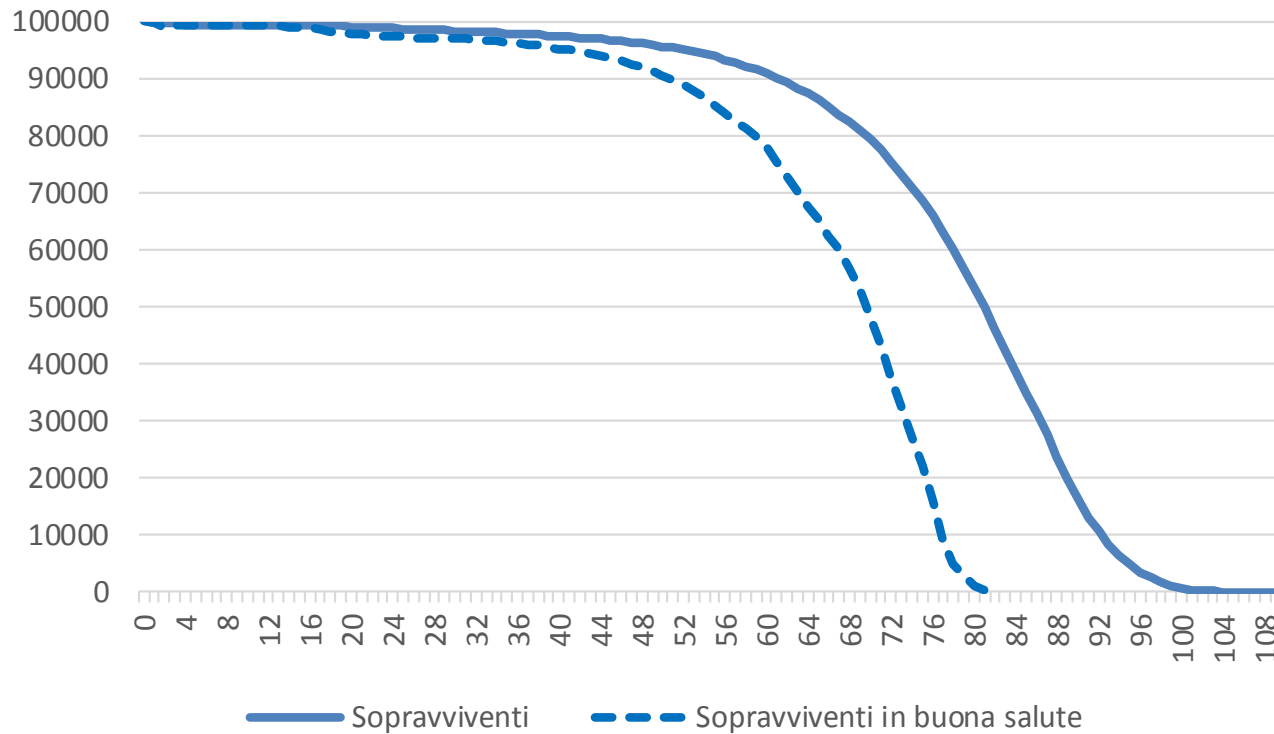
Measuring health: different dimensions to consider

- **Health**: A multidimensional concept
 - Morbidity: the medical dimension
 - * – Disability: the functional dimension
 - * – Self-rated health: the dimension based on individual perception

Disability is one of the most important health dimension for the elderly people's quality of life, being linked to their autonomy in daily life

SRH: a global measure of health based on the general question “**How is your health in general ?**”

How to include health status in Life Expectancy ? Health Expectancy



$$LE_x = [\sum_x L(x+\Delta x)] / I_x$$

$$HE_x = [\sum_x \underbrace{v_i(x+\Delta x)} L(x+\Delta x)] / I_x$$



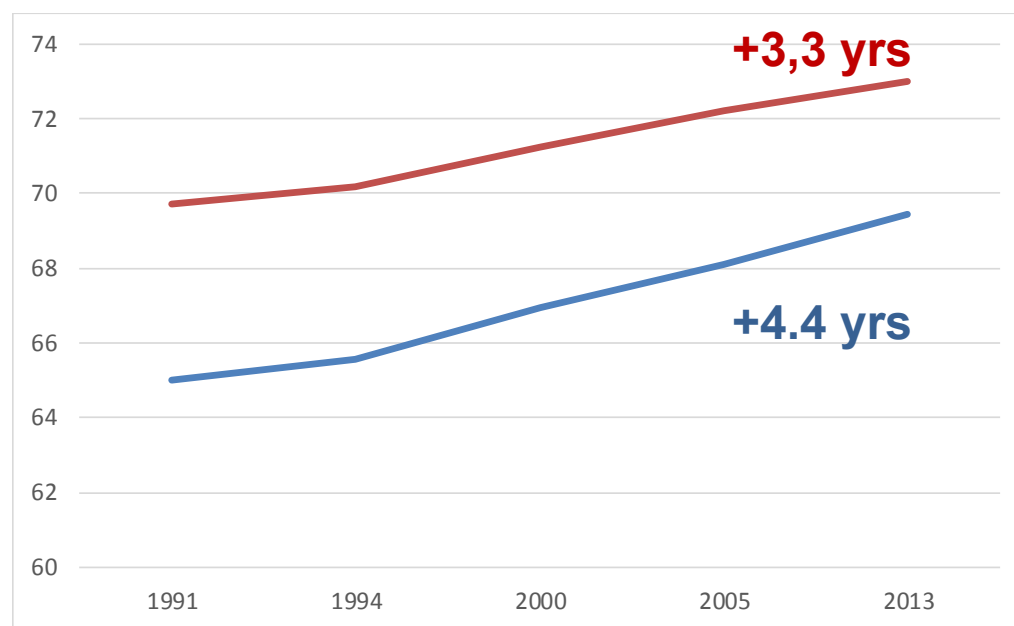
The Sullivan method



Prospective old-age threshold adjusted for disability (ref. year 1991)

15.2 yrs

Prospective age	MEN					WOMEN/MEN				
	1991	1994	2000	2005	2013	1991	1994	2000	2005	2013
LE	65.0	65.6	67.0	68.1	69.4	69.7	70.2	71.3	72.2	73.0
DFLE	65.0	65.9	67.3	68.3	69.6	67.2	67.6	68.5	69.2	69.7



Considering **RLE** and assuming as standard men's **RLE at 65 in 1991**, threshold advances 3-4 yrs

Women grow old later than men, although the difference is being reduced

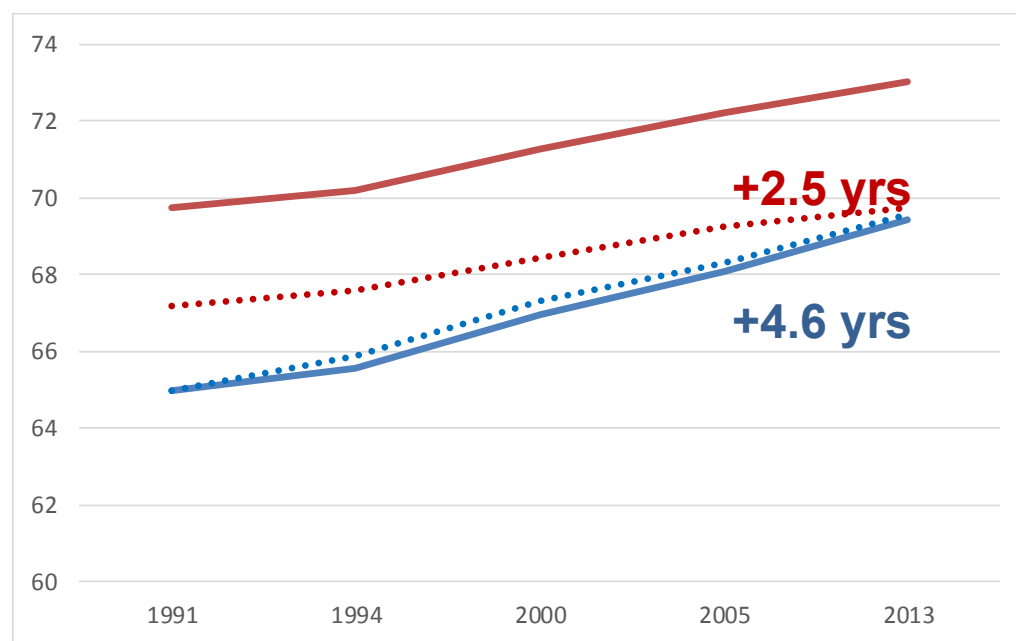


Prospective old-age threshold adjusted for **disability** (ref. year 1991)

15.2 yrs

12.1 yrs

Prospective age	MEN					WOMEN/MEN				
	1991	1994	2000	2005	2013	1991	1994	2000	2005	2013
LE	65.0	65.6	67.0	68.1	69.4	69.7	70.2	71.3	72.2	73.0
DFLE	65.0	65.9	67.3	68.3	69.6	67.2	67.6	68.5	69.2	69.7

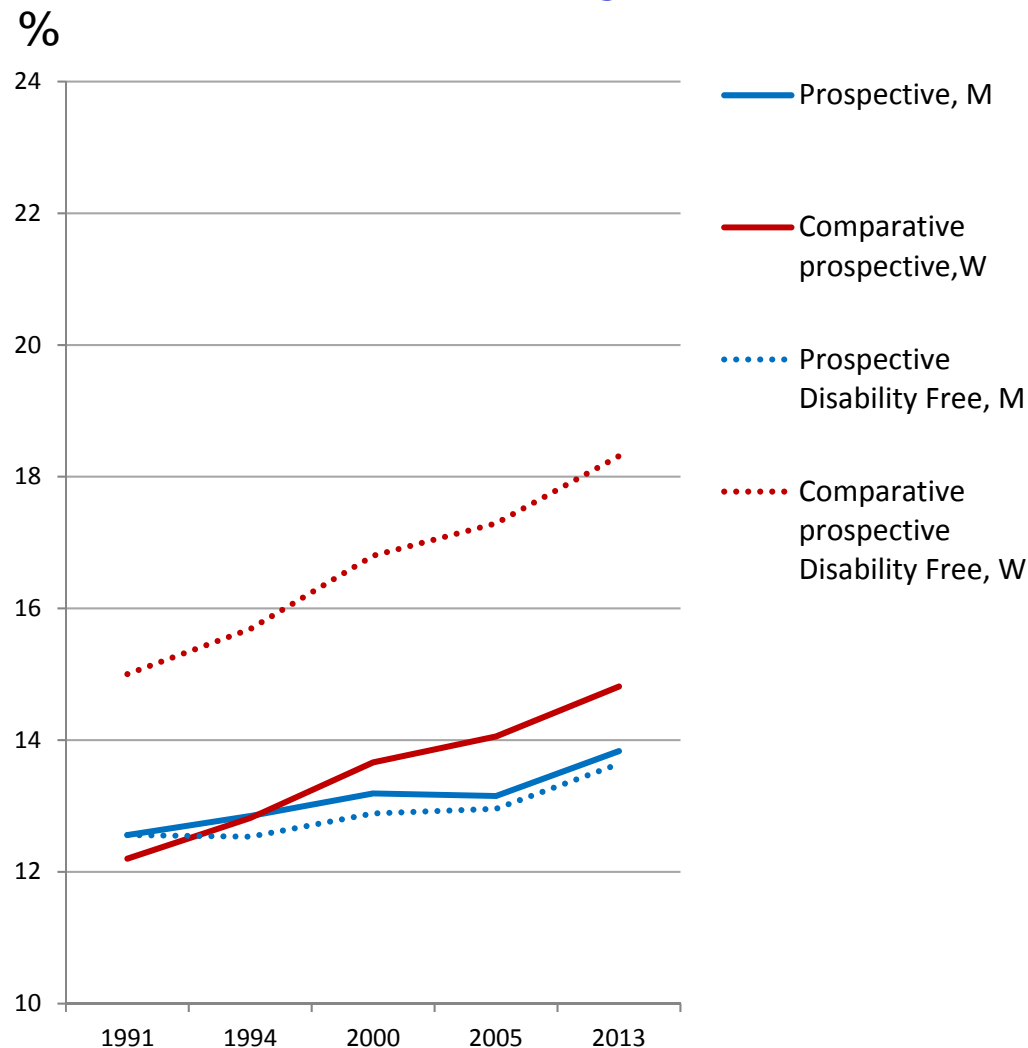


Considering **DFLE** and assuming as standard men's DFLE at 65 in 1991, **men's old-age threshold advances much more**

Women continue to grow old later than men **but the gap is strongly reduced (almost eliminated)**



Population ageing according to prospective old-age thresholds adjusted for **disability** (ref. year 1991)

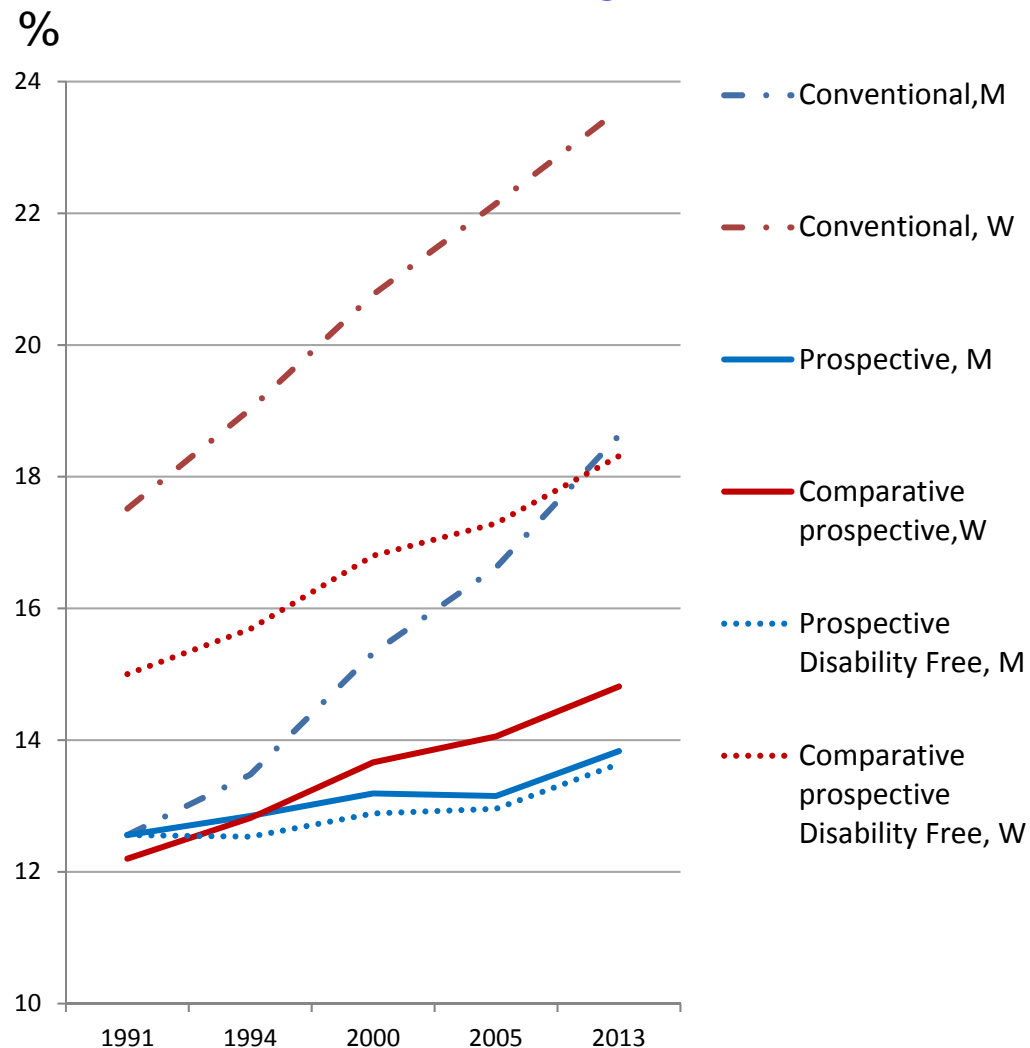


Adjusting prospective old-age thresholds for **disability** leads to:

- **lower** demographic ageing **for men**
- and **higher** (much higher) **for women**



Population ageing according to prospective old-age thresholds adjusted for **disability** (ref. year 1991)



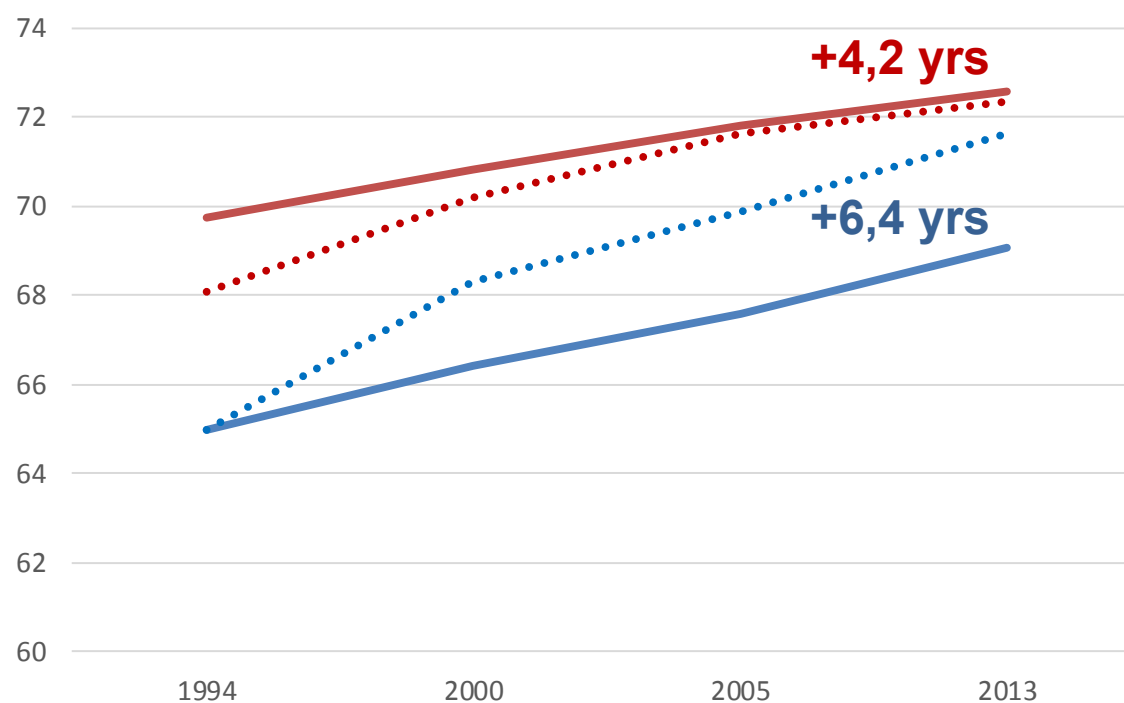
**Conventional thresholds
highly overestimate
population ageing**



Prospective old-age threshold taking into account Healthy Life Expectancy (ref. year 1994)

15.5 yrs
11.0 yrs

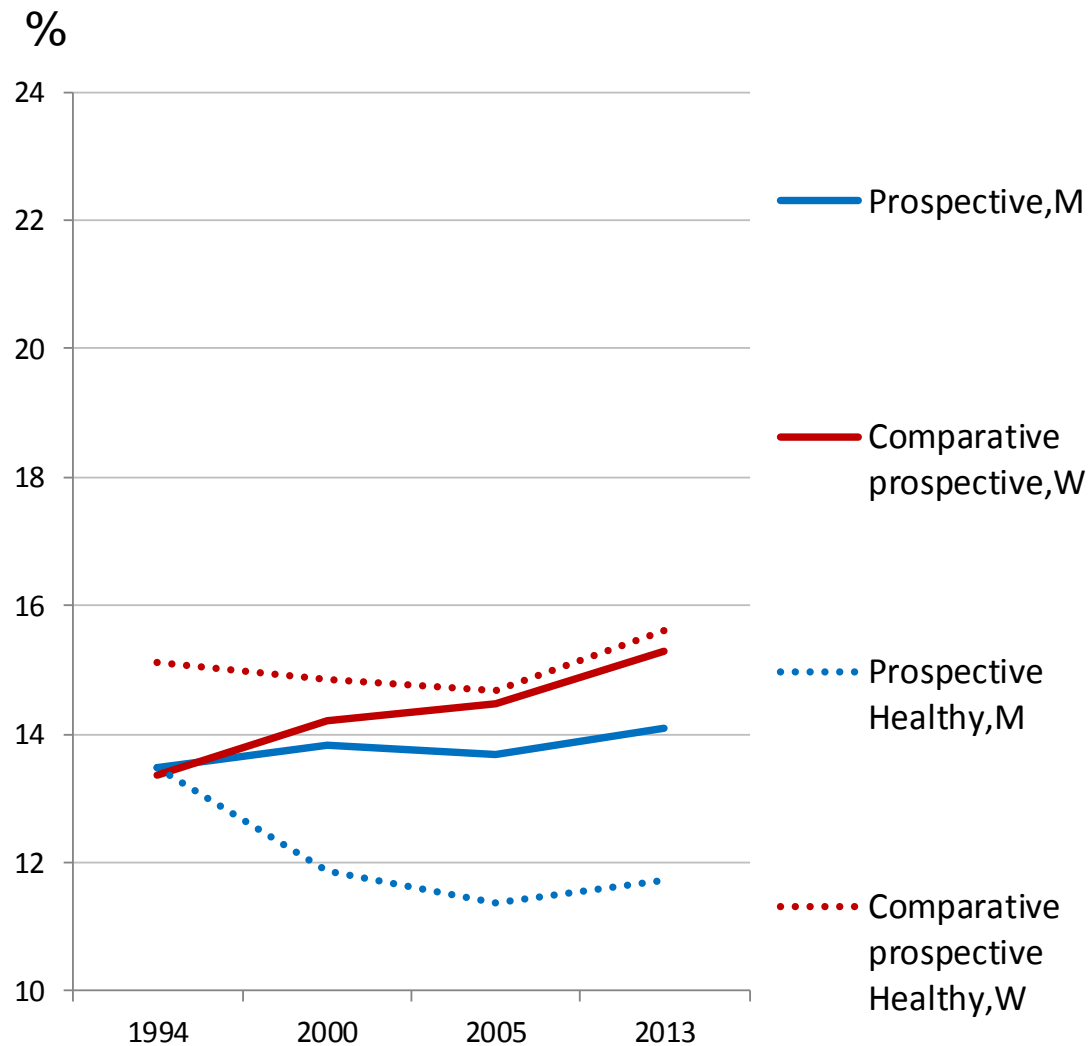
Prospective age	MEN				WOMEN/MEN			
	1994	2000	2005	2013	1994	2000	2005	2013
LE	65.0	66.4	67.6	69.1	69.7	70.8	71.8	72.6
HLE	65.0	68.3	69.9	71.6	68.1	70.2	71.6	72.3



Considering **HLE** and assuming as standard men's HLE at 65 in 1994, **old-age threshold advances much more**



Population ageing according to prospective ages having the same remaining **HLE** (ref. year 1994)



A much less pronounced population ageing when using **SRH adjusted prospective old-age threshold**

A process of rejuvenation for men (and for women until 2005)



Conclusions

- Population ageing is **one of the biggest challenges** for modern societies and **increased longevity plays a crucial role on it**
- The need for new concepts and measures
- **Measures based on prospective age** could be useful to better understand the changing reality
- **Is population ageing socially and economically sustainable?**
It depends on:
 - **our ability to remove cultural, social and institutional barriers segmenting life course**
 - **the future trends of health conditions among the elderly** ²³



Conclusions

- Until now, at least in Italy, increasing LE went hand in hand with improving health in older ages:
 - the years gained are mostly **without disability** (especially severe disability) and in **good SRH**
- Population ageing is very modest when considering health adjusted prospective age
 - **Rejuvenation** of men when considering thresholds based on HLE
- **Some negative signal for older women: a lower pace of improvement**



Conclusions

A crucial issue:

- All this is based on average values
- Wide and increasing **health and survival differences** by social status, also at older ages
 - In 2012 in Italy: a difference of life expectancy of **5.2 and 2.7** for men and women between the lowest and the highest education levels (**2.2 and 1.3** at 65)

Grazie per l'attenzione!





Changing health conditions of people over age 65 in Italy: disability

	MEN					WOMEN						
	1991	1994	2000	2005	2013	1991	1994	2000	2005	2013		
65 years												
LE	15.2	15.5	16.5	17.5	18.6	19.0	19.4	20.4	21.3	22.0		
DFLE	12.1	12.7	13.7	14.6	15.6	+	13.8	14.1	14.9	15.6	16.1	+
DLE	3.0	2.8	2.8	2.8	2.9	≈	5.1	5.2	5.4	5.6	5.9	+
HR (*100)	80.1	81.9	83.1	83.7	84.2	+	72.9	73.0	73.3	73.5	73.3	+

Good health increases more than survival:
higher DFLE and higher HR



Relative compression of disability (Fries 1989)



Changing health conditions over age 65: self-perceived health

	MEN				WOMEN			
	1994	2000	2005	2013	1994	2000	2005	2013
65 years								
LE	15.5	16.5	17.5	18.6	19.4	20.4	21.3	22.0
HLE	11.0	12.3	14.4	15.5	12.9	14.8	15.9	16.6
PHLE	4.5	4.3	3.0	3.1	6.5	5.6	5.3	5.4
HR (*100)	71.0	74.1	82.7	83.5	66.7	72.6	74.9	75.6

Good health increases more than survival:
higher DFLE higher HR and **lower PHLE**



Absolute compression of poor self-perceived health