

# An investigation into inequalities in adult lifespan

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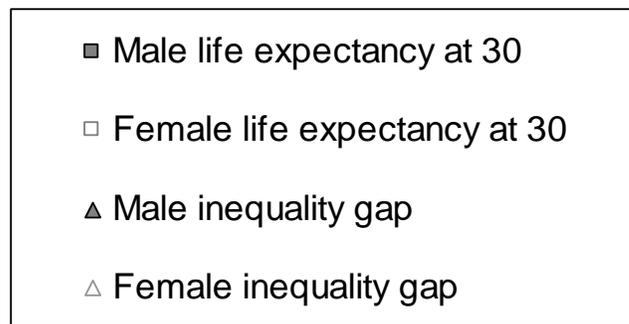
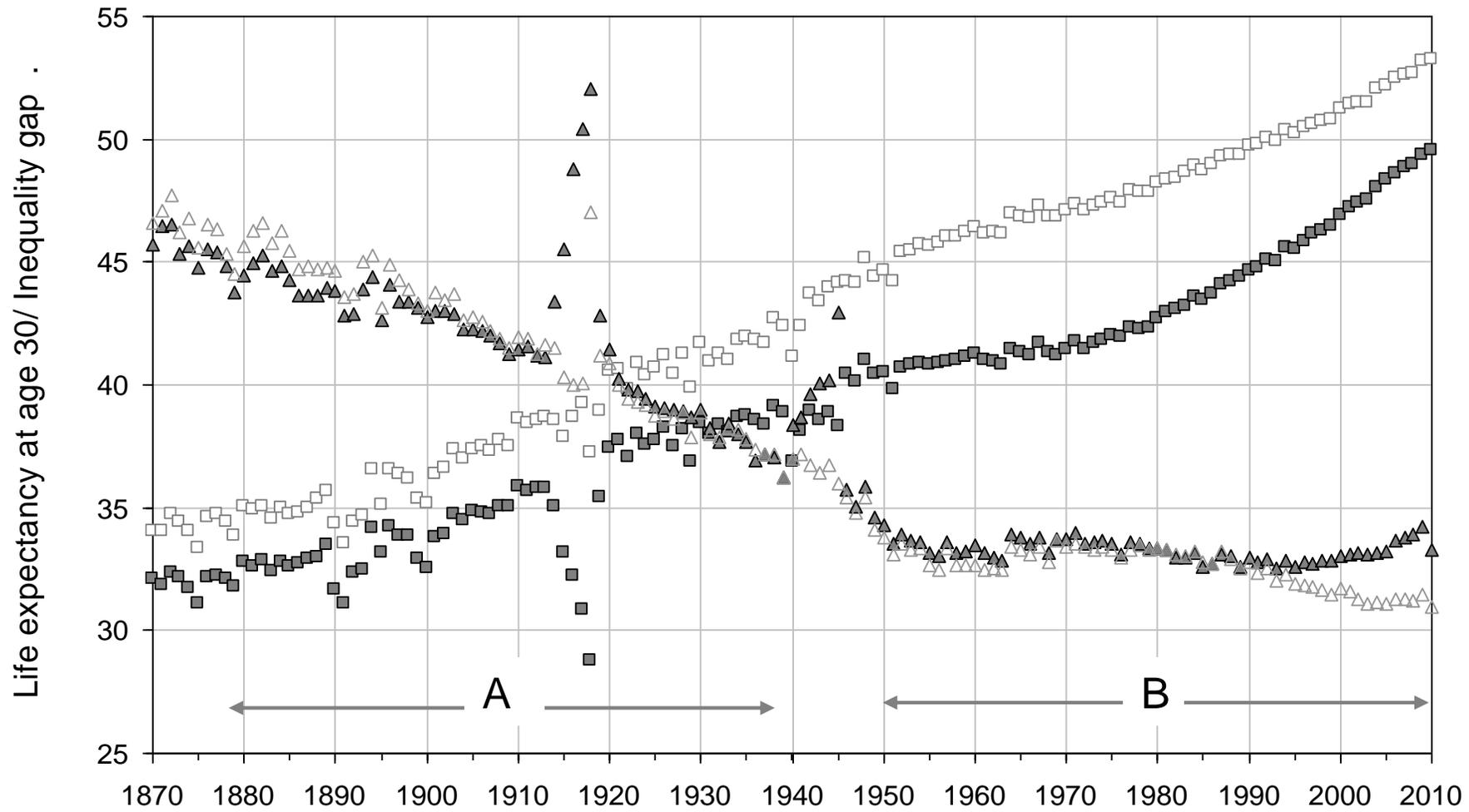


# Background

- People in the UK are living longer than ever...
- ...but the gap between the oldest and shortest lived (from age 30) appears to be increasing
- This is the first time this has happened since the 1870's
- This raises a few issues
  - Is it morally correct that some people are being 'left behind'?
  - Why are they being 'left behind'?
  - Will this prevent the increase in life expectancy that we have seen over most of the last 100 years?

# Methodology

- We use the HMD to provide data for England & Wales, France and Italy
- For people who have reached age 30 we calculate for both males and females
  - Expected future lifetime;
  - The age where we have observed the first 10% of deaths
  - The age achieved by the top 5% of survivors
  - The 'inequality gap' i.e. the difference in age between these two ages
  - The 'gender gap' i.e. the difference in expected future life between males and females



Year

# Overview

- We term the trend prior to 1940 the 'convergent phase'. We observed that
  - the age inequality gap, as measured by the dispersion in lifespan, narrowed considerably
  - Life expectancy continued to rise throughout this period for both genders, and the gender gap was relatively small
- If life expectancy had continued to improve and reductions in lifespan had continued to narrow at similar rates to pre-1940, inequalities would have eventually disappeared
  - resulting in a 'rectangularisation' of the survival curve (i.e. everyone lives to the same age)

# Overview

- We term the period from 1950 to 1990 as the 'parallel phase'
- This refers to the inequality gap which remained relatively constant rather than its previous period of reduction
- As the trend of convergence fundamentally transitioned after 1950 into the 'parallel' phase, it suggests that factors operating pre-1940 had exhausted their influence
- Although life expectancy continued to rise throughout this period for both genders, the gender gap i.e. the difference between male and female life expectancy which had been relatively small up to 1940 then started to grow post-1950 reaching a peak in 1970 when female life expectancy was 5.7 years greater

# Overview

- Since 1990 the trends in inequalities has changed for both genders
- Males have seen an increase in the inequality gap i.e. they are in a period of divergence
- Females have seen a reduction in the inequality gap i.e. they are in a period of convergence
- But this has been at a time when male life expectancy has been increasing faster than female life expectancy

## England & Wales – Males (Age 30)

<b>Year</b>	<b>Period A</b>			<b>Period B</b>		
	<b>1879</b>	<b>1909</b>	<b>1939</b>	<b>1950</b>	<b>1980</b>	<b>2010</b>
<b>Age reached by top 5%</b>	84.6	85.8	87.0	88.0	89.8	95.7
<b>Age reached by bottom 10%</b>	39.7	43.9	49.8	53.5	56.6	62.4
<b>Inequality gap in years</b>	44.9	41.9	37.2	34.5	33.2	33.3
<b>Future life expectancy</b>	32.2	35.2	38.7	40.5	42.7	49.6

## **England & Wales – Females (Age 30)**

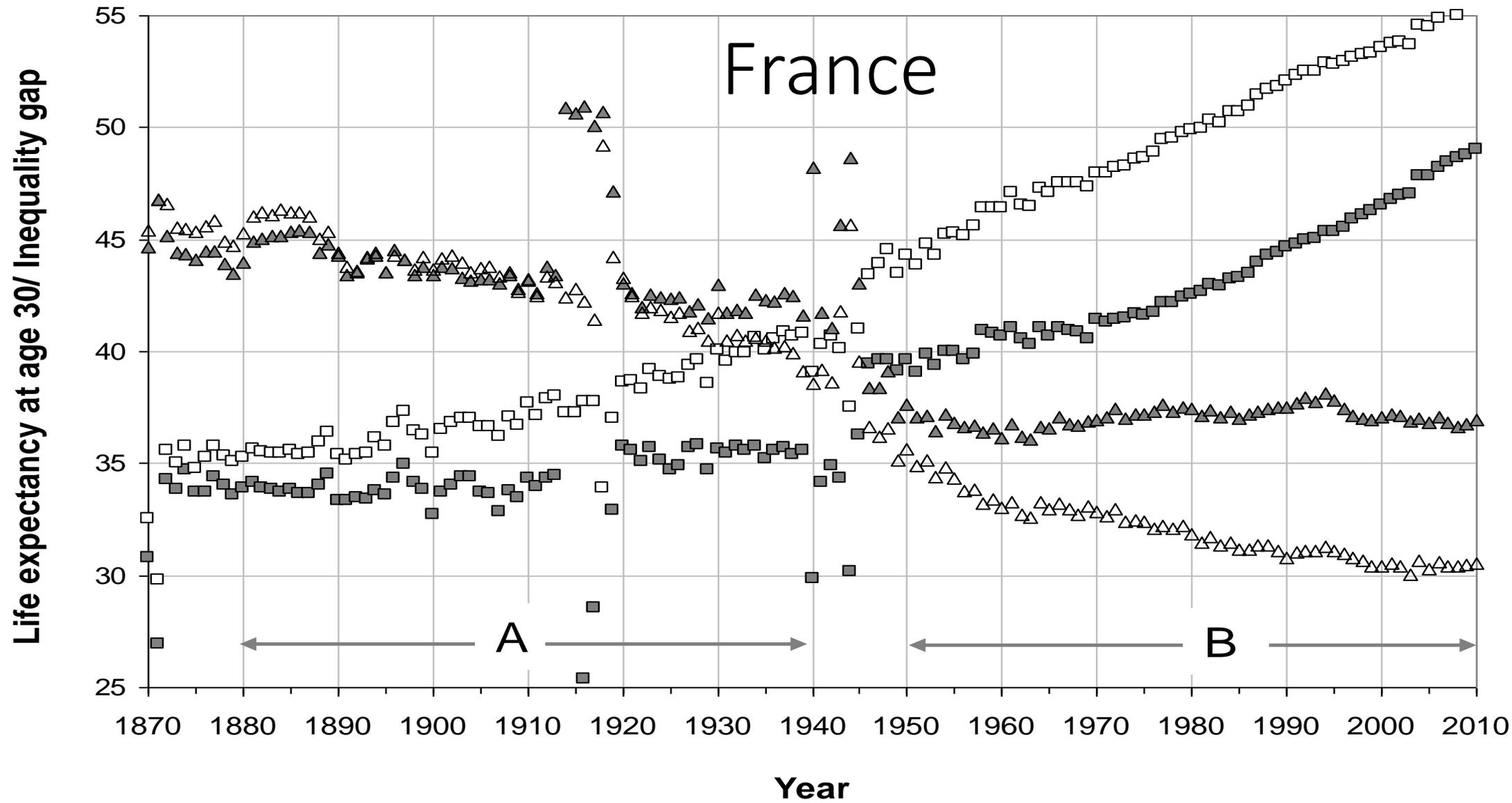
<b>Year</b>	<b>Period A</b>			<b>Period B</b>		
	<b>1879</b>	<b>1909</b>	<b>1939</b>	<b>1950</b>	<b>1980</b>	<b>2010</b>
<b>Age reached by top 5%</b>	86.6	88.2	90.1	91.5	94.4	98.2
<b>Age reached by bottom 10%</b>	40.6	46.2	52.7	57.4	61.2	67.3
<b>Inequality gap in years</b>	46.0	42.0	37.3	34.1	33.2	31.0
<b>Future life expectancy</b>	34.5	37.9	42.1	44.8	48.2	53.3

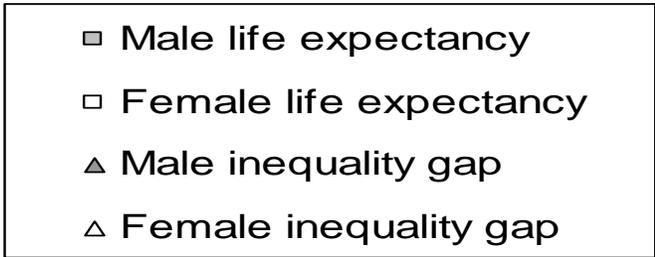
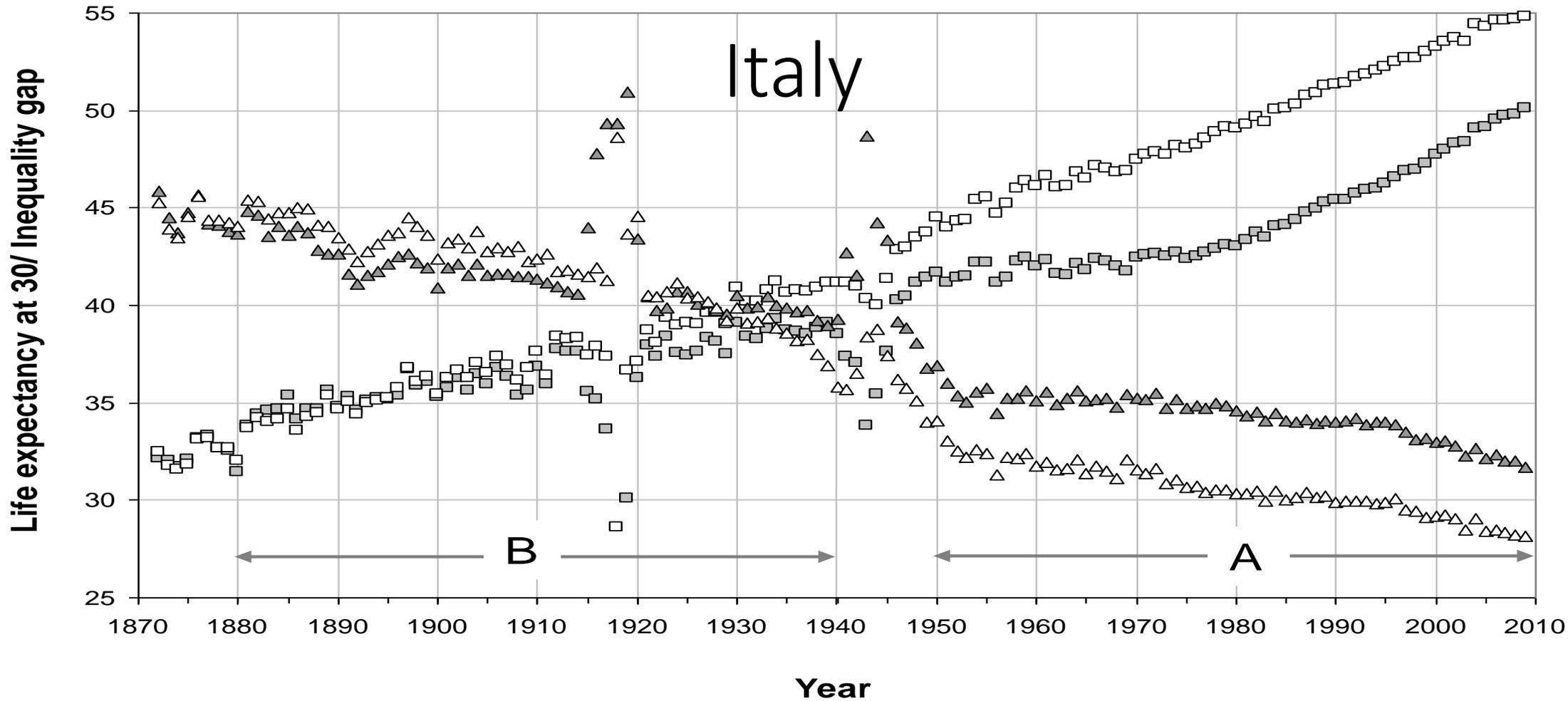
# Comparisons between genders

	<b>1879</b>	<b>1909</b>	<b>1939</b>	<b>1950</b>	<b>1980</b>	<b>2010</b>
<b>Women – men life expectancy at age 30 (years)</b>	2.3	2.7	3.3	4.3	5.5	3.7
<b>Change in inequality gap</b>						
<b>Gender</b>		1880 to 1939			1950 to 2010	
<b>Men</b>		-7.7			-1.2	
<b>Women</b>		-8.6			-3.1	

# Is England and Wales unique?

- To see if the patterns observed in England & Wales were unique we analysed the data for France and Italy as well
- These countries are similar in terms of size and wealth, and also have the same level of past data on HMD





# Some brief comments

- Male life expectancy in England & Wales at age 30 is currently higher than in either France or Italy, although the margin of difference post 1950 is usually about one year or less
- Female life expectancy in France and Italy is currently higher than in England & Wales and has improved by greater amounts since 1950
- In England & Wales, the gender gap in life expectancy fell from 5.5 years to 3.7 years between 1980 and 2010 but in France it only fell from 7.3 to 6.3 years and in Italy it rose from 5.9 to 6.1 years

# Some brief comments

- In absolute terms, the male age inequality gap is currently higher in France than in England & Wales which in turn is higher than in Italy
  - 37.0 years in France, 33.3 years in England & Wales, 31.7 years in Italy
- The fact that male age inequalities in Italy continued to narrow in period B by more than in period A is especially worthy of note
- In absolute terms, the female age inequality gap is currently lowest in Italy,
  - 28.2 years in Italy, 30.6 years in France and 31.0 years in England & Wales
- The level of improvement in Italy and France has been notably higher than in England & Wales. In Italy, for example, the gap closed by 5.8 years but in England & Wales by only 3.1 years

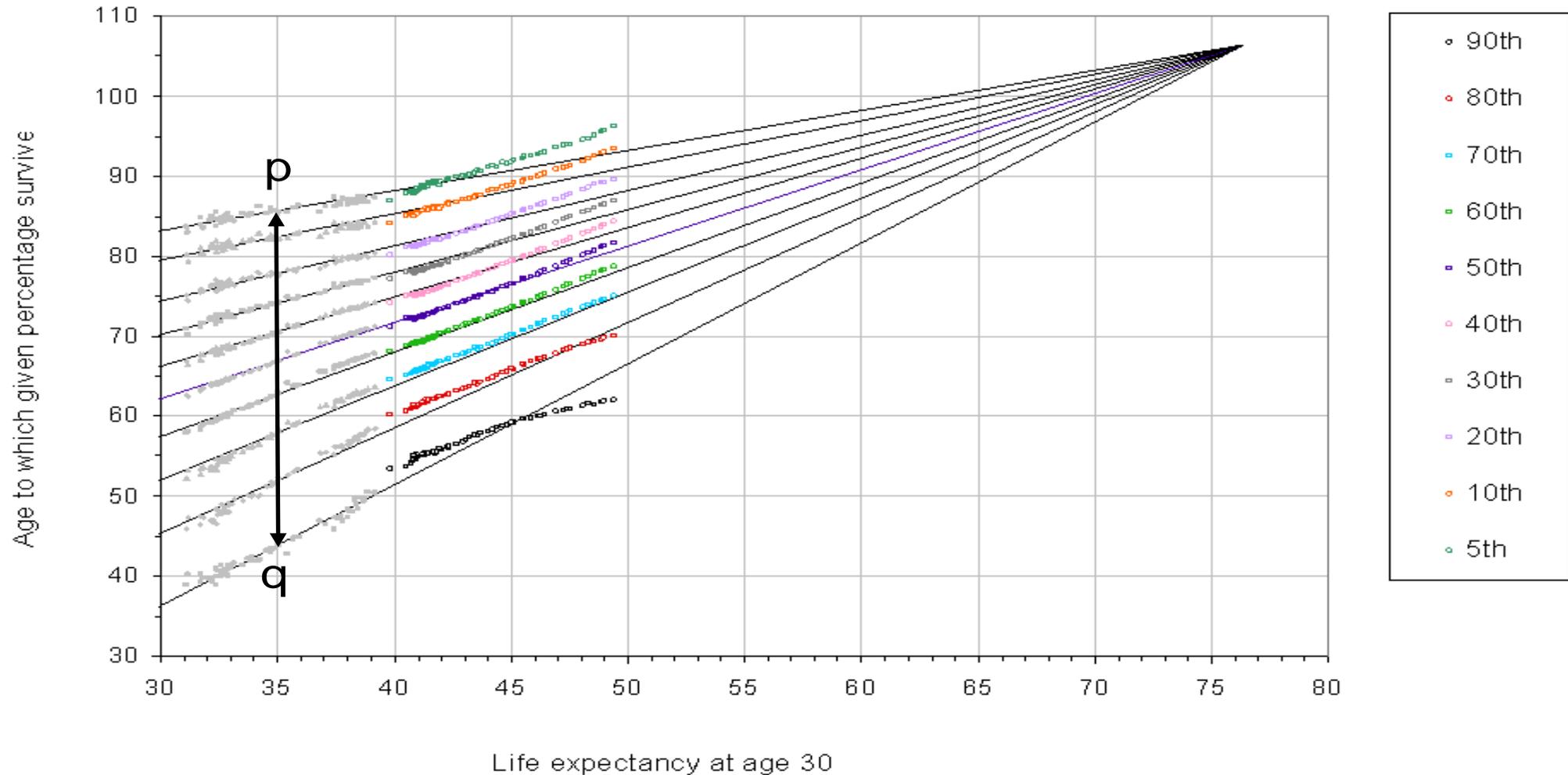
# Some brief comments

- If gender differences in age-related inequalities are compared, we find that the gap is currently bigger in France than in either Italy or England and Wales and that it also continues to widen.
- In England and Wales the gap in age inequalities between the genders has been the lowest of all three countries and remarkably similar throughout periods A and B. However, this similarity ceased after 1990 when the gap started to re-widen.
- Despite some similarities, the trends shown in these charts and the differences especially between the genders are hard to account for and hence explain
- But is there an underlying pattern for all of the data?

# Finding the pre-1940 convergence

- We noted earlier that if pre-1940 trends had continued then there would have been a convergence in the expected future life
- To find this convergence we assumed that all lives followed the same path i.e. it did not depend on gender or nationality
- We then fitted linear regression lines to our data with an assumed convergence point
- We iterated the process to find the single convergence age that gave the best fit over all datasets
- This gave an age of death of 106 (or an expected future lifetime of 76)

# England and Wales Males



# Males – Pre 1940

<b>Survival percentiles</b>	<b>England and Wales</b>	<b>France</b>	<b>Italy</b>	<b>Average slope value <math>\beta'_p</math></b>
<b>5%</b>	0.5013	0.5057	0.5072	0.5047
<b>10%</b>	0.5784	0.5792	0.5857	0.5811
<b>20%</b>	0.6890	0.6818	0.6878	0.6862
<b>30%</b>	0.7794	0.7670	0.7721	0.7728
<b>40%</b>	0.8645	0.8504	0.8530	0.8560
<b>50%</b>	0.9543	0.9414	0.9374	0.9444
<b>60%</b>	1.0543	1.0450	1.0353	1.0449
<b>70%</b>	1.1710	1.1717	1.1561	1.1663
<b>80%</b>	1.3165	1.3329	1.3182	1.3225
<b>90%</b>	1.5116	1.5410	1.5435	1.5320
<b>Adjusted <math>R^2</math></b>	9.9204	9.1896	8.9836	9.3645

# Females – Pre 1940

<b>Survival percentiles</b>	<b>England and Wales</b>	<b>France</b>	<b>Italy</b>	<b>Average slope value <math>\beta'_p</math></b>
<b>5%</b>	0.4760	0.4884	0.5120	0.4921
<b>10%</b>	0.5586	0.5649	0.5921	0.5719
<b>20%</b>	0.6697	0.6691	0.6911	0.6766
<b>30%</b>	0.7620	0.7550	0.7720	0.7630
<b>40%</b>	0.8489	0.8368	0.8484	0.8447
<b>50%</b>	0.9385	0.9243	0.9269	0.9299
<b>60%</b>	1.0407	1.0263	1.0184	1.0285
<b>70%</b>	1.1661	1.1536	1.1350	1.1516
<b>80%</b>	1.3313	1.3358	1.3119	1.3263
<b>90%</b>	1.5657	1.5970	1.5748	1.5792
<b>Adjusted <math>R^2</math></b>	9.8516	9.8126	9.6340	9.7661

# Post 1950 Data

- For data in the parallel phase we carried out standard linear regression fits to determine the relationship between overall life expectancy and the age of death for each percentile

# Males – Post 1950

<b>Survival percentiles</b>	<b>England and Wales</b>	<b>France</b>	<b>Italy</b>	<b>Average slope value <math>\beta</math></b>
<b>5%</b>	0.892	0.871	0.791	0.851
<b>10%</b>	0.932	0.926	0.830	0.896
<b>20%</b>	0.986	1.002	0.882	0.957
<b>30%</b>	1.034	1.059	0.924	1.006
<b>40%</b>	1.072	1.103	0.969	1.048
<b>50%</b>	1.098	1.132	1.019	1.083
<b>60%</b>	1.123	1.140	1.074	1.112
<b>70%</b>	1.126	1.118	1.137	1.127
<b>80%</b>	1.075	1.031	1.193	1.100
<b>90%</b>	0.929	0.828	1.188	0.982
<b>Aggregate <math>R^2</math></b>	9.963	9.956	9.937	9.952

# Females – Post 1950

<b>Survival percentiles</b>	<b>England and Wales</b>	<b>France</b>	<b>Italy</b>	<b>Average slope value <math>\beta</math></b>
<b>5%</b>	0.852	0.777	0.796	0.808
<b>10%</b>	0.900	0.824	0.840	0.855
<b>20%</b>	0.951	0.884	0.897	0.911
<b>30%</b>	0.975	0.934	0.939	0.949
<b>40%</b>	1.001	0.982	0.974	0.986
<b>50%</b>	1.017	1.030	1.008	1.018
<b>60%</b>	1.029	1.082	1.041	1.051
<b>70%</b>	1.040	1.139	1.079	1.086
<b>80%</b>	1.076	1.194	1.127	1.132
<b>90%</b>	1.130	1.183	1.191	1.168
<b>Aggregate <math>R^2</math></b>	9.943	9.983	9.981	9.969

# Brief comments

- The post-1950 phase is not perfectly parallel. Each country in our group shows that the age to which 90% survive has a slope parameter of less than one for men but greater than one for women
- It shows that men in the 90<sup>th</sup> percentile have not kept pace with the overall pace of change in life expectancy, unlike women
- Between roughly the 30<sup>th</sup> and 80<sup>th</sup> percentiles, survival is running slightly ahead of the overall trend in life expectancy for both men and women (i.e. slope values are greater than one)
- Among other percentiles the slopes are slightly less than one meaning that survival is not quite keeping pace relative to life expectancy

# Conclusions

- Pre 1940, all countries saw improving life expectancy and a narrowing of the inequality gap
- This can be due to large improvements in life expectancy benefiting the poor more than the rich
  - Clean water
  - improved sanitation
  - greater health and safety
  - affordable housing
  - cleaner air
  - mass vaccination against infectious diseases

# Conclusions (continued)

- What has changed post 1950?
  - The large gains from the previous changes have now occurred
- There has been a transformation in the way people die
- Most deaths today are from chronic rather than infectious disease or other causes including accidents
- We know that nearly all chronic disease is associated with middle to old age and affect strands of society differently
- Other work we have carried out shows mortality rates in middle age to be over twice as high in the poorest quintile of households than in the richest quintile

# Conclusions (continued)

- To reduce the inequality gap may be the best way to increase overall life expectancy
- Need to target lifestyle choices
  - Smoking
  - Diet
  - Excessive alcohol consumption
  - Exercise
- However, this is proving to be much more difficult as these choices are often ingrained in parts of society