



# Explaining inequality in mortality and health across the UK

Pia Wohland

Institute for Ageing and Health, Newcastle University

InHALE -

Inequalities in Healthy Active Life Expectancy: the role of time, place, person and methods

ESRC Research Fund RES-062-23-2970 1 October 2011 - 30 September 2014

<http://research.ncl.ac.uk/InHALE>

# Outline

- How do we measure variation in mortality and health? What is health expectancy and why is it useful?
- What do we know about health expectancies in the UK?
- Research project
- Inequalities in mortality and health in the UK
  - across local areas
  - across ethnic groups

**Life expectancy** = expected number of remaining years of life at a particular age

**Health expectancy** = expected number of remaining years of life spent healthy

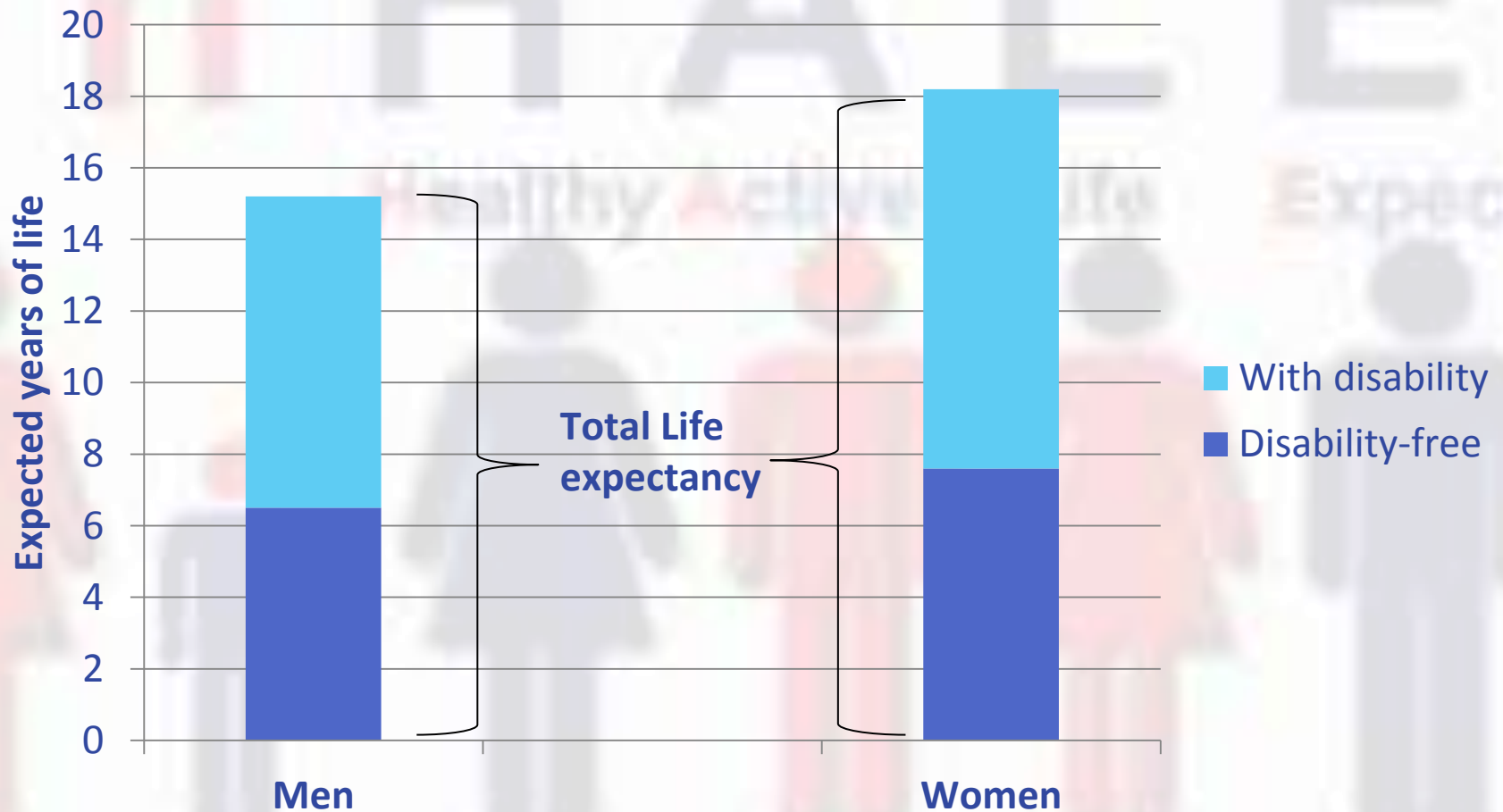
Health expectancy

- partitions years of life at a particular age into years healthy and unhealthy
- adds information on quality to life expectancy



<http://murderiseverywhere.blogspot.co.uk/2012/01/quality-of-life.html>

# Example: Disability-free life expectancy at age 65 (Newcastle 2001)



# Are the extra years healthy ones? - theory

## Pessimists

- Increases in life expectancy due to keeping the old and frail alive for longer (Kramer 1980)



## Optimists

- Onset and progression of chronic diseases are being delayed (Fries 1980, 2011)

## Dynamic Equilibrium

- More disability but less severe (Manton, 1982)

© Original Artist  
Reproduction rights obtainable from  
www.CartoonStock.com



“Yes, it all comes down to quality of life. An inheritance sure would help.”

# How – methods for health expectancy

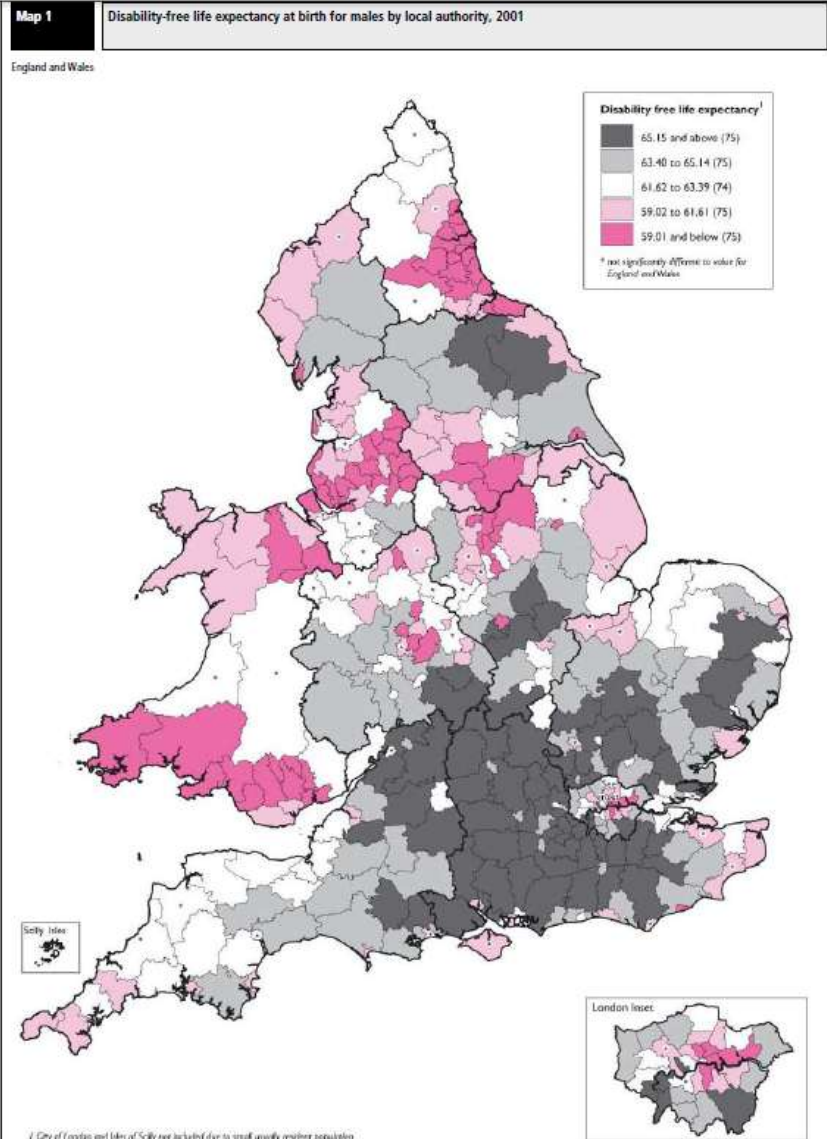
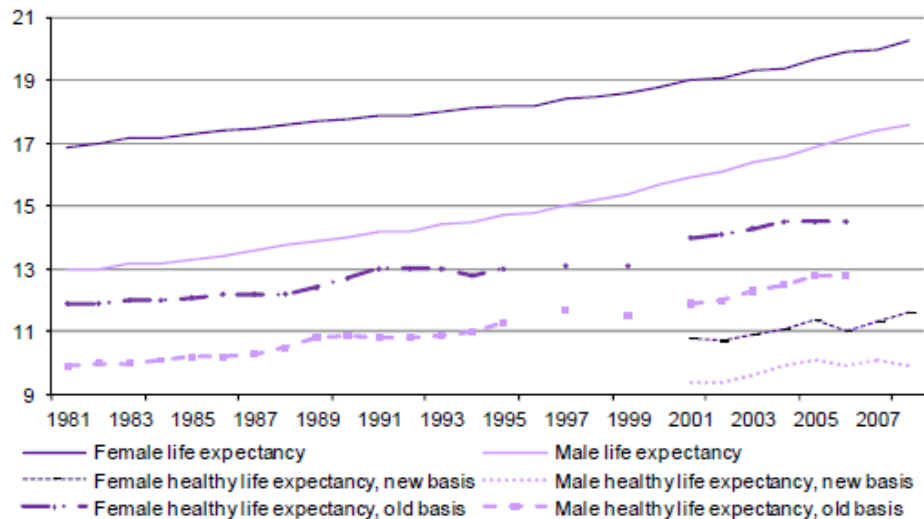
- The simplest method of calculating a health expectancy is Sullivan's method (Sullivan 1971) with:
  - prevalence of the health state from a cross-sectional survey
  - a standard life table for the same period
- Multi-state life tables require longitudinal data on transitions between health states and death

# Health expectancy statistics

## Period life expectancy and healthy life expectancy at 65: by sex<sup>1,2,3,4</sup>, 1981 to 2008

Great Britain

Years





# The project





# InHALE project

<http://research.ncl.ac.uk/InHALE>

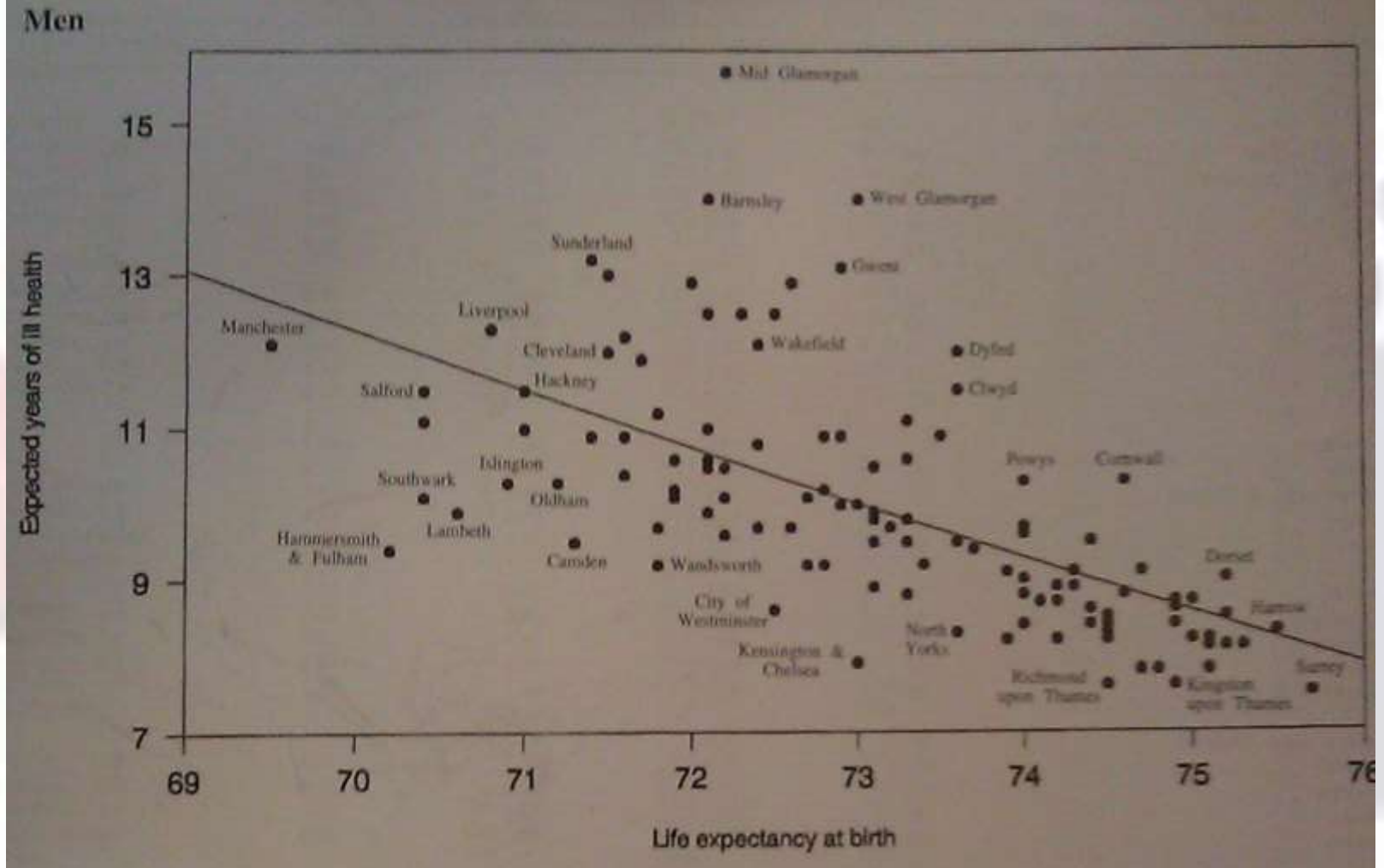
- **WP1** The role of social factors in explaining variations in HLE and DFLE at different ages between geographic areas
- **WP2** The role of individual level social, health and lifestyle factors in explaining the variations in HLE and DFLE between population subgroups
- **WP3** Evaluating methods to calculate health expectancies using cross-sectional and longitudinal data

# **WP1 The role of social factors in explaining variations in HLE and DFLE at different ages between geographic areas**

- How have LA changed with respect to LE and DFLE between 1991 and 2001 and are the patterns of change the same for LE and DFLE at different ages?
- Can the changes over time be explained by changes in area level social factors (deprivation, ethnic minority levels, unemployment, etc)?
- Which social factors explain the variation in HLE and DFLE between LA in England and Wales in 2001 and are these the same as 1991 (DFLE)?

# Local area analysis 1991

Figure 7.1: Life expectancy at birth and expected years of ill-health, local authorities in England and Wales, 1991

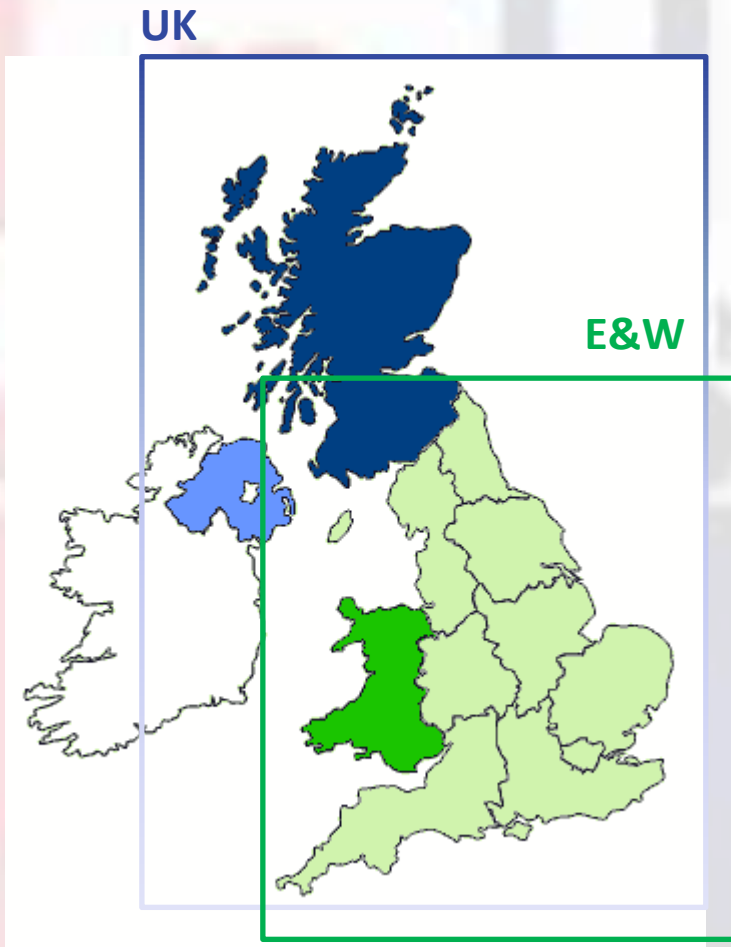


# Local area analysis 1991

**Table 7.6: Regression analysis of factors affecting the mean HLE rates of local authority areas in England and Wales**

Factors	HLE for Males				HLE for Females			
	Regression coefficient	Standard error	Beta coefficient	Significance level	Regression coefficient	Standard error	Beta coefficient	Significance level
Social Class IV and V (%)	-0.20	0.04	-0.29	< 1%	-0.20	0.03	-0.34	< 1%
Unemployment Rate (%)	-0.37	0.05	-0.53	< 1%	-0.24	0.04	-0.40	< 1%
Population Sparsity	-0.78	0.27	-0.14	< 1%	-0.52	0.23	-0.11	< 1%
Retirement Migration	1.29	0.19	0.39	< 1%	1.34	0.16	0.46	< 1%
Non-white Population (%)	0.08	0.02	0.27	< 1%	0.05	0.01	0.22	< 1%
Constant	68.45				70.97			
R <sup>2</sup>	0.827				0.825			

# Geography 2001



- England and Wales (E&W) 376 (374) local authorities
- with Scotland and Northern Ireland 434

# 1991 and 2001 data



- Geography
- Age bands
- Census Question

# Census questions

## ○ 1991

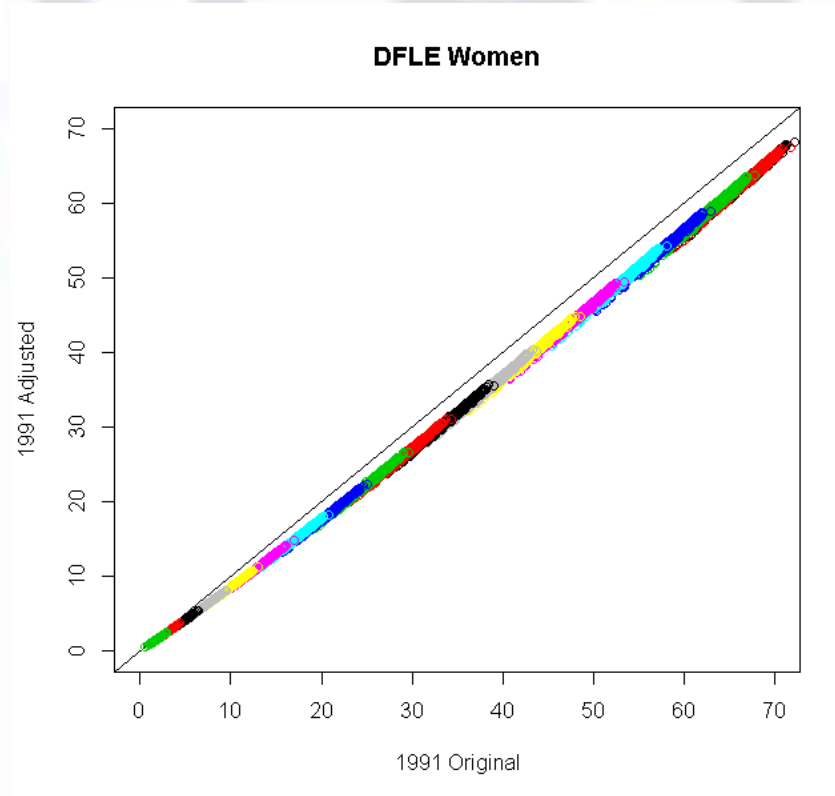
- Do you have any long-term illness, health problem or **handicap** which limits your daily activities or the work you can do? **Include problems which are due to old age.**
- Yes, I have a health problem which limits activities
- I have no such health problem

## ○ 2001

- Do you have any long-term illness, health problem or disability which limits your daily activities or the work you can do? **Include problems which are due to old age.**
- Yes
- No



# Impact of adjustment



Marshall, A. (2009) Developing a methodology for the estimation and projection of limiting long term illness and disability, PhD Thesis, School of Social Sciences, University of Manchester.



Inequalities in

**I**n **H**A **L**E

Healthy **A**ctivities

**L**ife

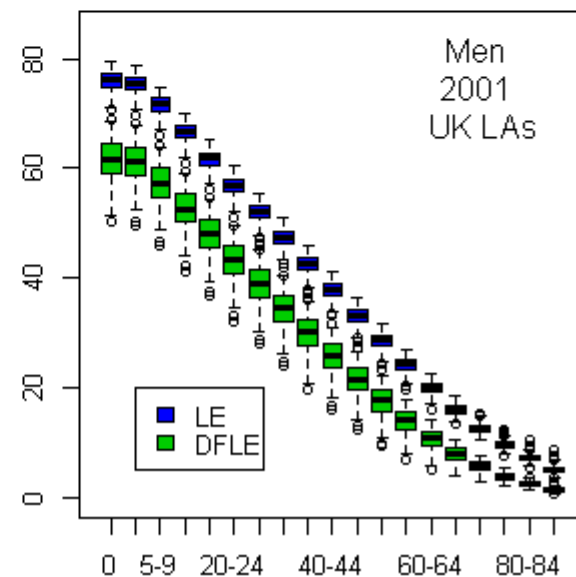
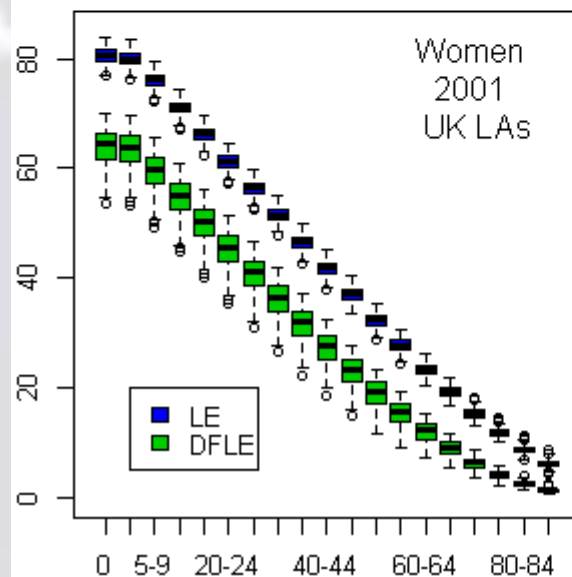
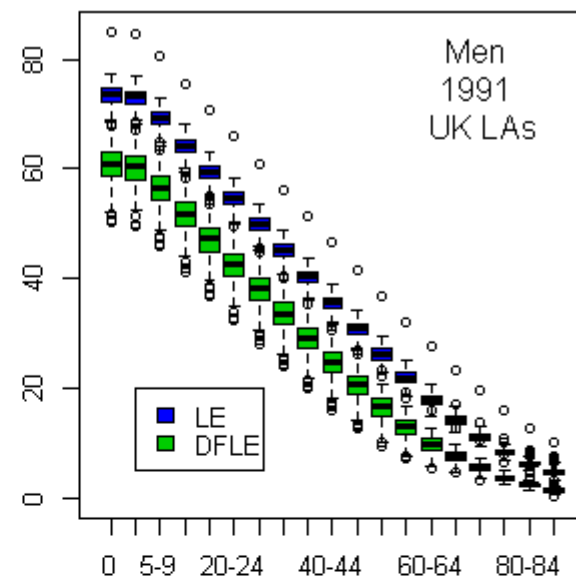
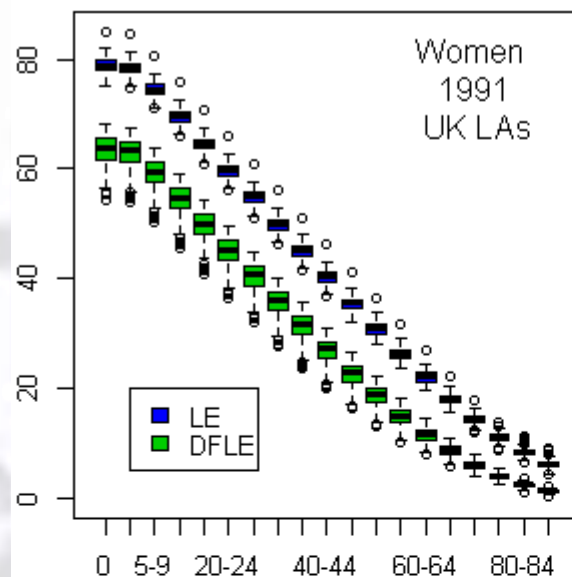
**E**xpectancy

# Results



# Life expectancy (LE) & Disability free life expectancy (DFLE)

across local areas in England and Wales  
In 1991 (top) and 2001 (bottom)  
Women (left) and Men (right)



# Has inequality changed?

## Ranges and dispersion

DFLE	Women age 0, UK			Women age 0, E			
	1991bf	1991ad	2001	1991bf	1991ad	2001	
90-10	5.9	6.5	8.5	90-10	5.9	6.5	7.7
IqR	3.3	3.8	4.8	IqR	3.2	3.5	3.9
SD	2.4	2.6	3.2	SD	2.3	2.5	2.9
MEAN	67.4	63.5	64.0	MEAN	67.8	63.9	64.6
	Men age 0, UK			DFLE	Men age 0, E		
90-10	7.3	7.7	9.3	90-10	7.0	7.5	8.6
IqR	4.1	4.4	5.4	IqR	3.9	4.2	4.7
SD	2.8	3.0	3.5	SD	2.7	2.9	3.3
MEAN	63.8	60.5	61.5	MEAN	64.3	61.0	62.2

# Has inequality changed?

## Ranges and dispersion

	Women age 50, UK			Men age 50, UK		
	1991bf	1991cr	2001	1991bf	1991cr	2001
90-10	4.8	4.9	6.3	5.5	5.4	6.7
IqR	2.6	2.6	3.8	3.2	3.2	3.7
SD	1.8	1.8	2.4	2.2	2.1	2.5
MEAN	21.1	18.6	19.1	18.5	16.6	17.6

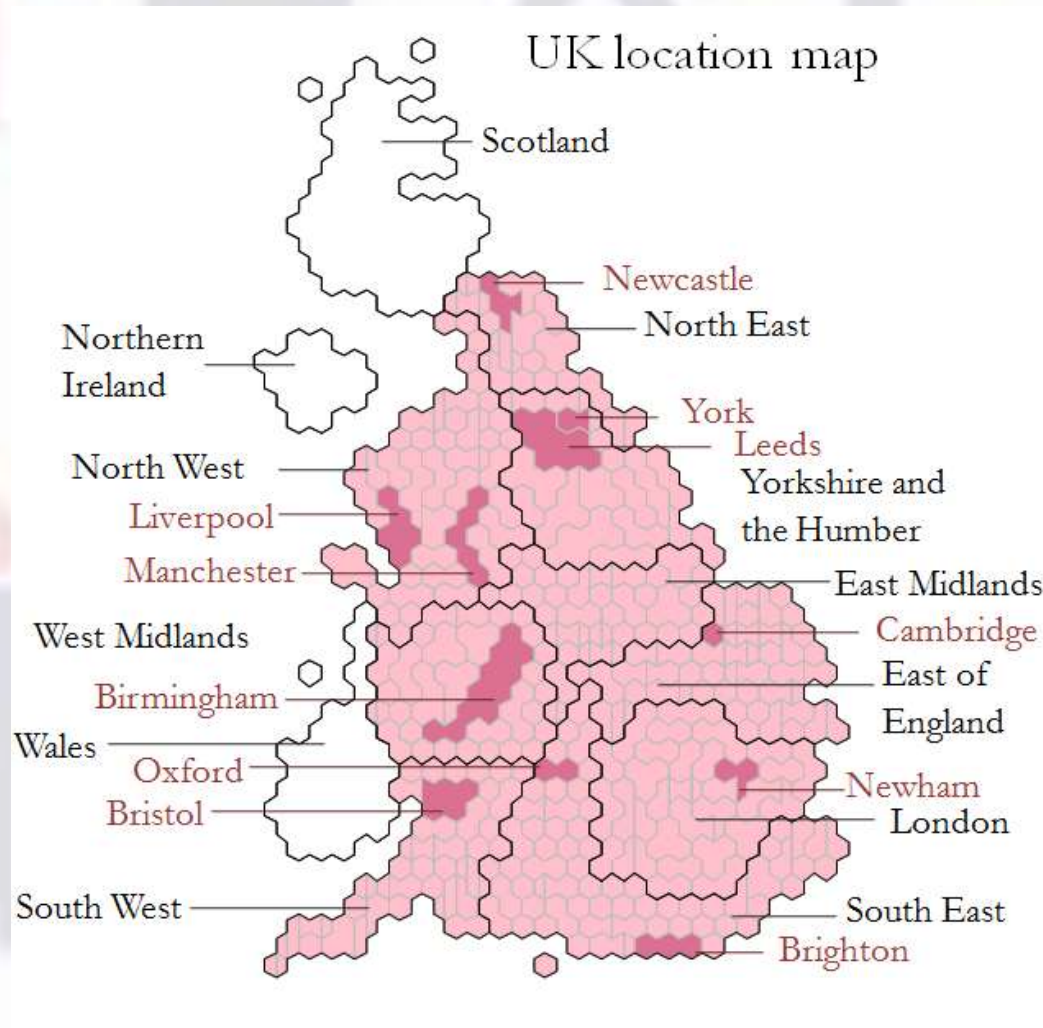
  

	Women age 65, UK			Men age 65, UK		
	1991bf	1991cr	2001	1991bf	1991cr	2001
90-10	2.9	2.6	3.6	2.8	2.6	3.5
IqR	1.5	1.4	2.0	1.6	1.4	2.0
SD	1.1	1.0	1.4	1.1	1.0	1.3
MEAN	10.2	8.7	9.1	8.6	7.6	8.1

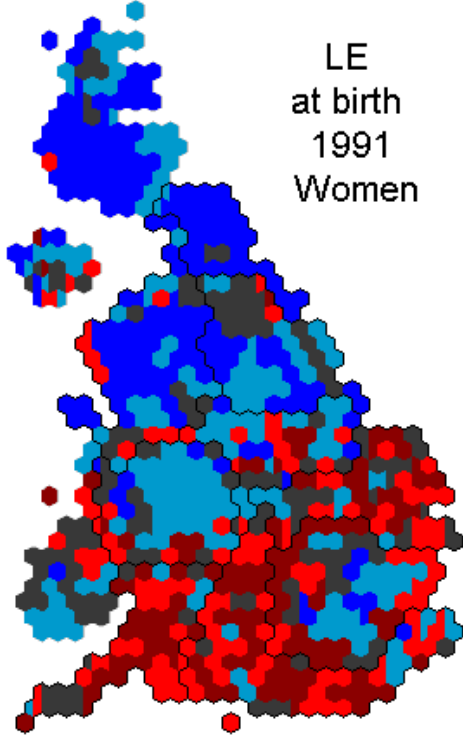
	Women age 85, UK			Men age 85, UK		
	1991bf	1991cr	2001	1991bf	1991cr	2001
90-10	0.8	0.7	0.8	0.9	0.7	0.9
IqR	0.4	0.3	0.5	0.5	0.4	0.4
SD	0.3	0.3	0.3	0.4	0.4	0.3
MEAN	1.7	1.4	1.4	1.8	1.6	1.6

# Geographical distribution of life expectancy (LE) and disability free life expectancy (DFLE)

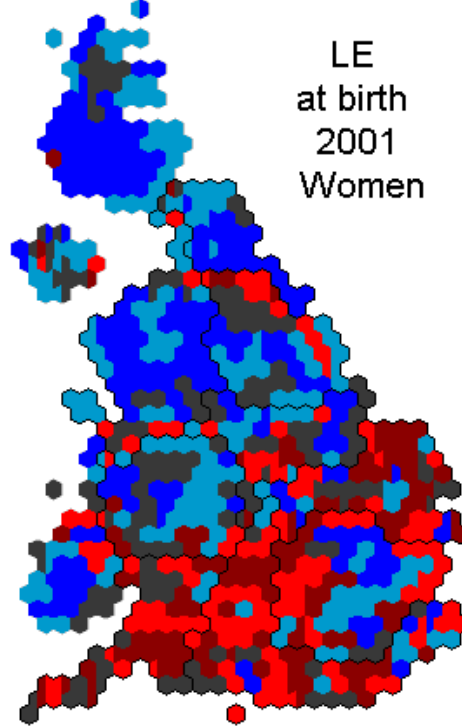


# Women at birth

LE  
at birth  
1991  
Women



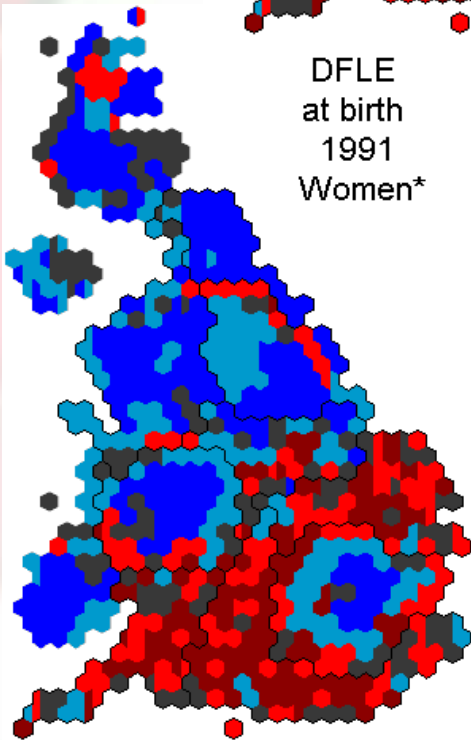
LE  
at birth  
2001  
Women



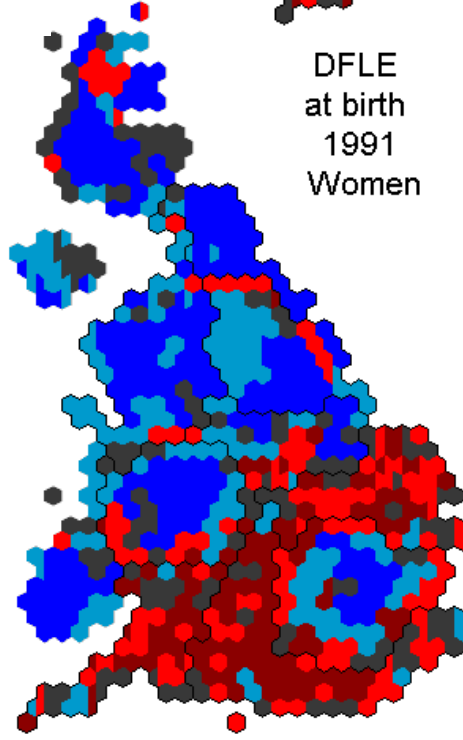
## Quintiles

- Bottom
- Lower middle
- Middle
- Upper middle
- Top

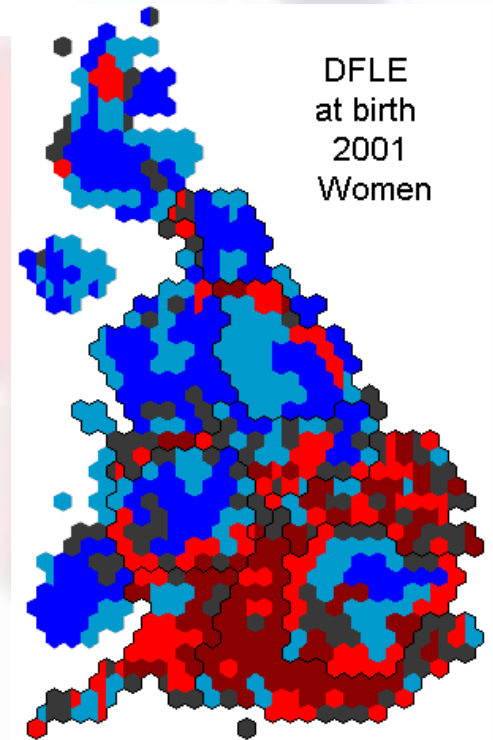
DFLE  
at birth  
1991  
Women\*



DFLE  
at birth  
1991  
Women

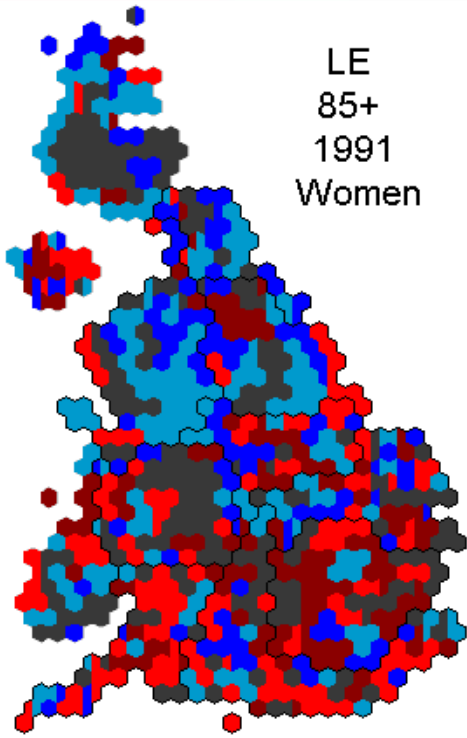


DFLE  
at birth  
2001  
Women

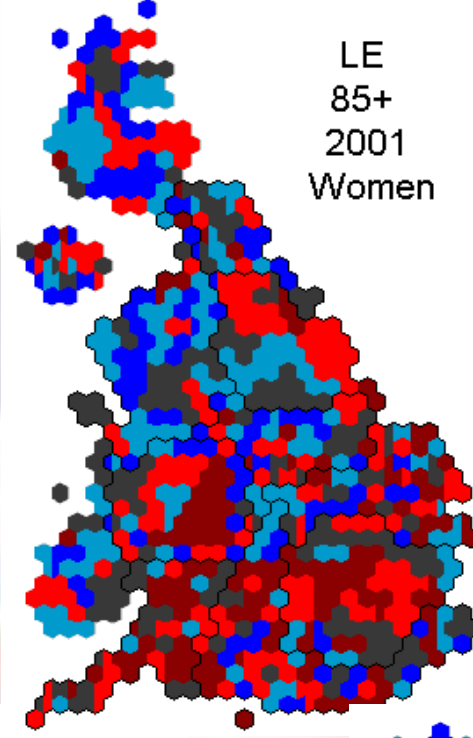


# Women 85+

LE  
85+  
1991  
Women



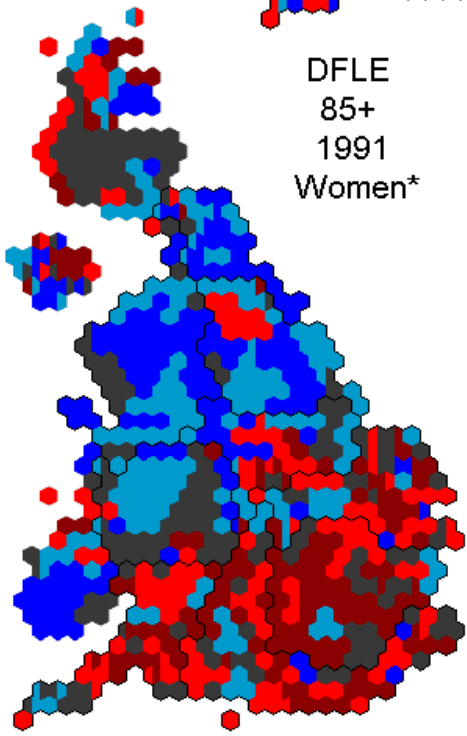
LE  
85+  
2001  
Women



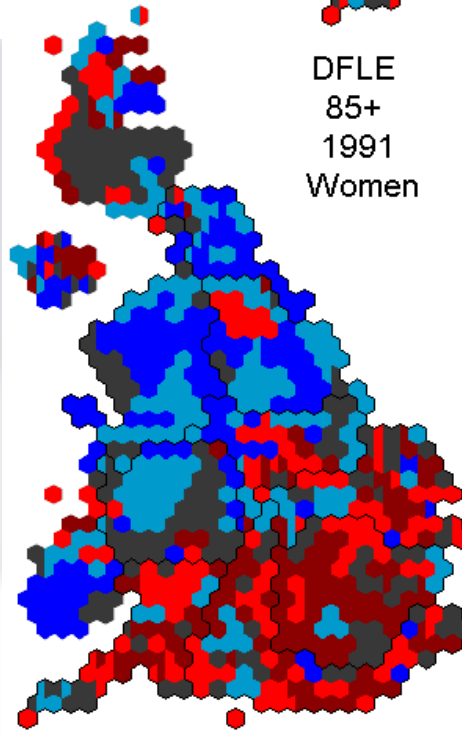
Quintiles

- Bottom
- Lower middle
- Middle
- Upper middle
- Top

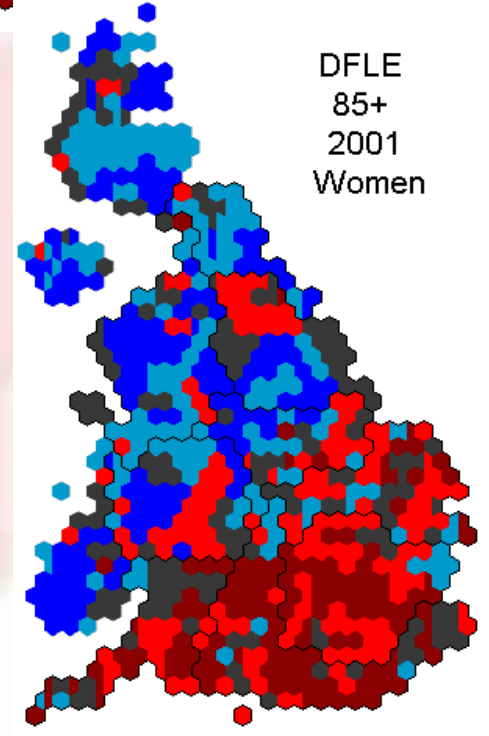
DFLE  
85+  
1991  
Women\*



DFLE  
85+  
1991  
Women



DFLE  
85+  
2001  
Women





# Urban to rural (England only)

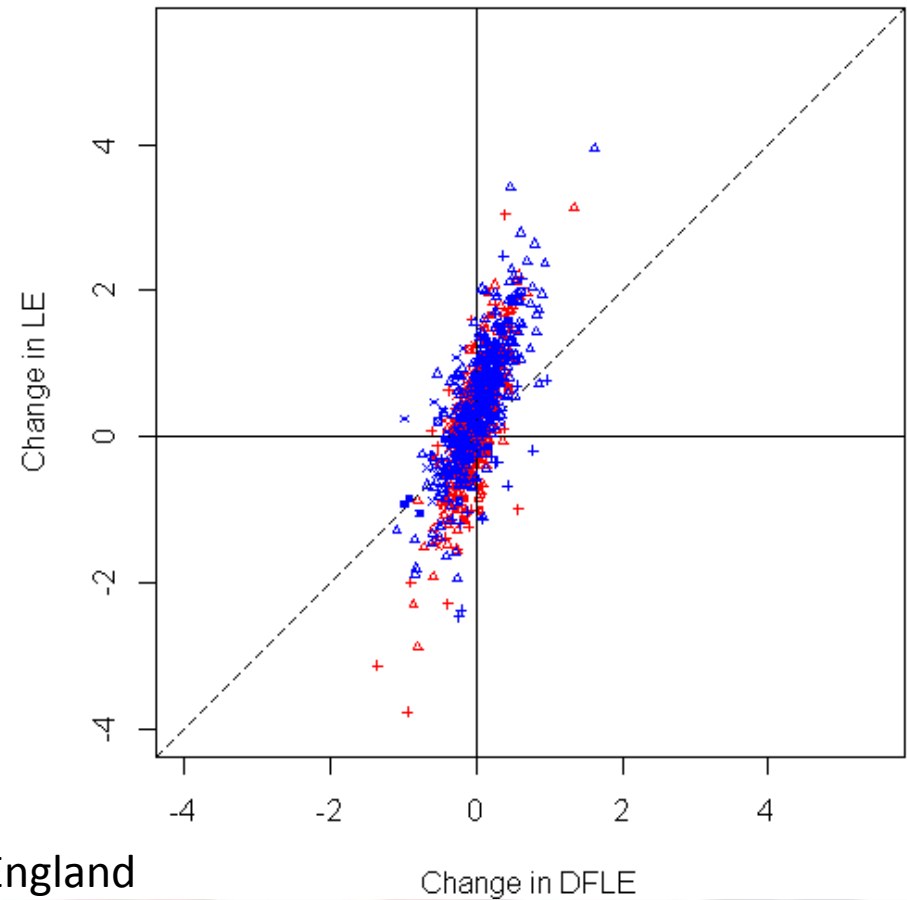
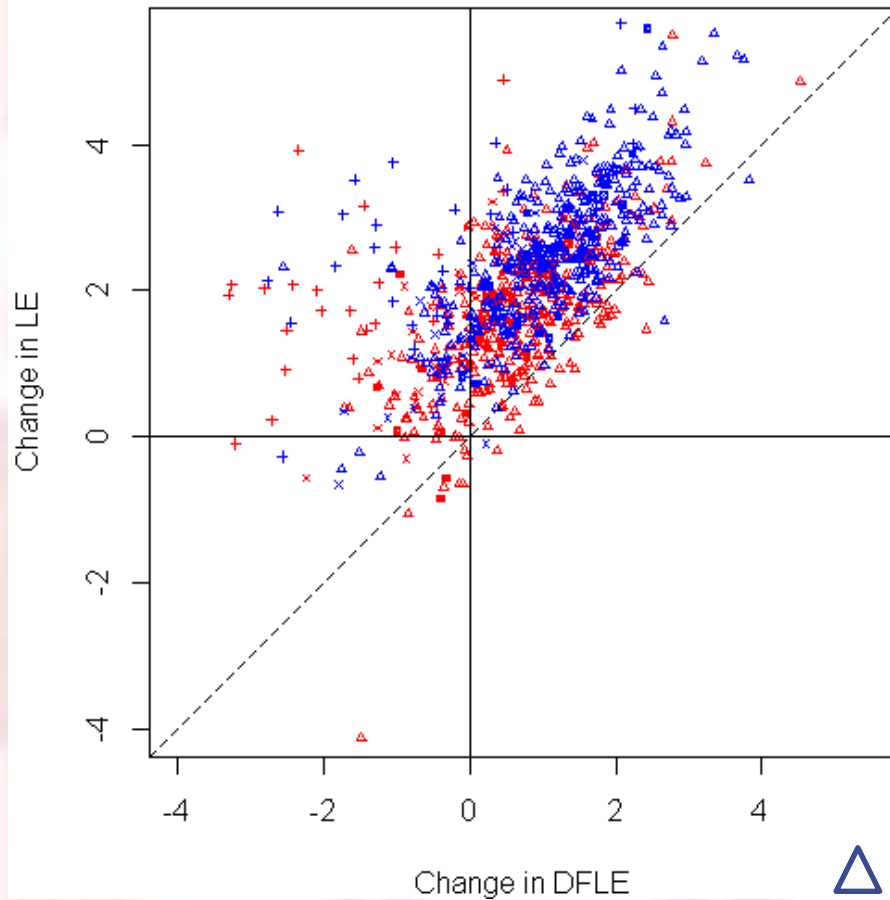
	1991				2001			
	DFLE	DFLE	DFLE	DFLE	DFLE	DFLE	DFLE	DFLE
	M0	F0	M85+	F85+	M0	F0	M85+	F85+
'Major Urban'	59.6	62.6	1.59	1.46	60.8	63.3	1.68	1.51
'Large Urban'	60.3	63.3	1.56	1.41	61.5	64.0	1.63	1.44
'Other Urban'	60.2	63.0	1.55	1.40	61.1	63.5	1.57	1.37
'Significant Rural'	62.2	64.8	1.61	1.44	63.6	65.7	1.65	1.45
'Rural 50'	61.7	64.5	1.59	1.45	63.0	65.3	1.62	1.41
'Rural 80'	62.4	65.1	1.64	1.45	63.6	66.1	1.67	1.53

**DEFRA Classification**

# Change in LE vs.DFLE between 1991 and 2001 UK LAs

At birth

85+



- △ England
- Wales
- × Scotland
- + Northern Ireland

# Deprivation quintiles-over time (England only)

Least deprived



Most deprived

	1991				2001			
	DFLE	DFLE	DFLE	DFLE	DFLE	DFLE	DFLE	DFLE
	M0	F0	M85+	F85+	M0	F0	M85+	F85+
1	64.1	66.4	1.65	1.50	65.9	67.8	1.72	1.50
2	63.0	65.6	1.62	1.47	64.5	66.7	1.73	1.55
3	61.4	64.2	1.60	1.42	62.6	65.0	1.62	1.43
4	59.2	62.3	1.54	1.36	59.9	62.5	1.50	1.31
5	57.3	60.8	1.55	1.45	58.3	61.1	1.62	1.48

Townsend index, population based quintiles

# Deprivation quintiles-old and new (England only)

Least deprived

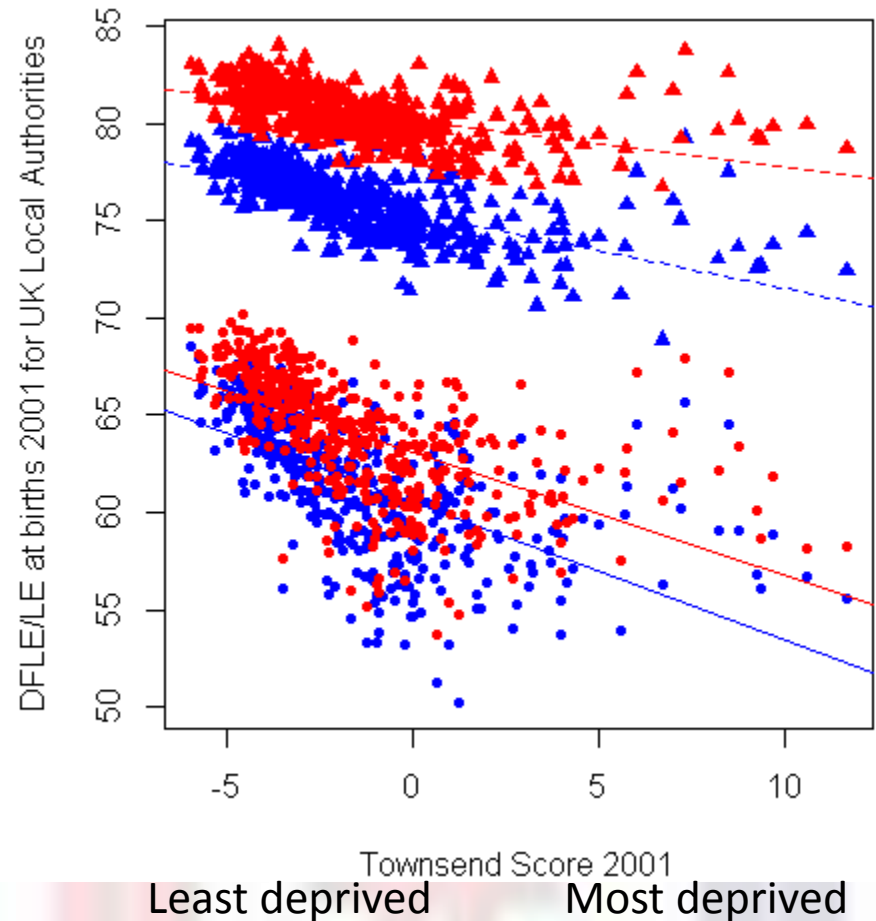
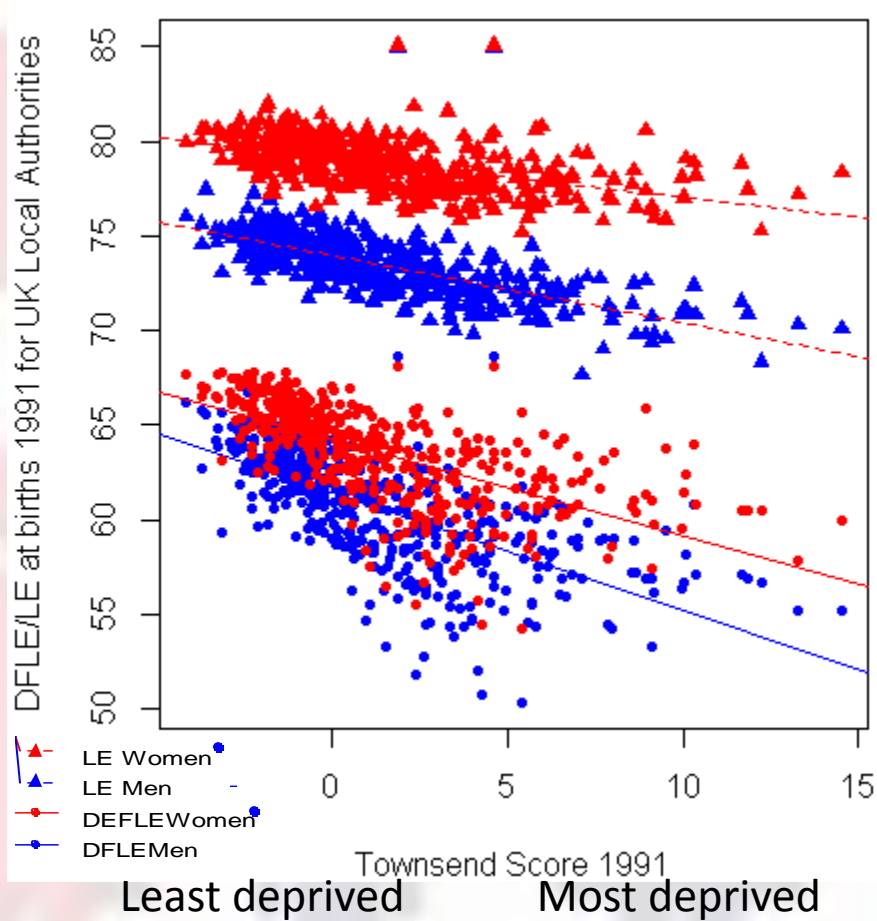


Most deprived

	1991				2001			
	DFLE M0	DFLE F0	DFLE M85+	DFLE F85+	DFLE M0	DFLE F0	DFLE M85+	DFLE F85+
1	64.1	66.4	1.65	1.50	64.3	66.5	1.70	1.50
2	63.0	65.6	1.62	1.47	61.2	63.7	1.55	1.38
3	61.4	64.2	1.60	1.42	59.4	62.1	1.51	1.31
4	59.2	62.3	1.54	1.36	58.4	61.2	1.54	1.38
5	57.3	60.8	1.55	1.45	58.9	61.5	1.78	1.68

Townsend index, population based quintiles

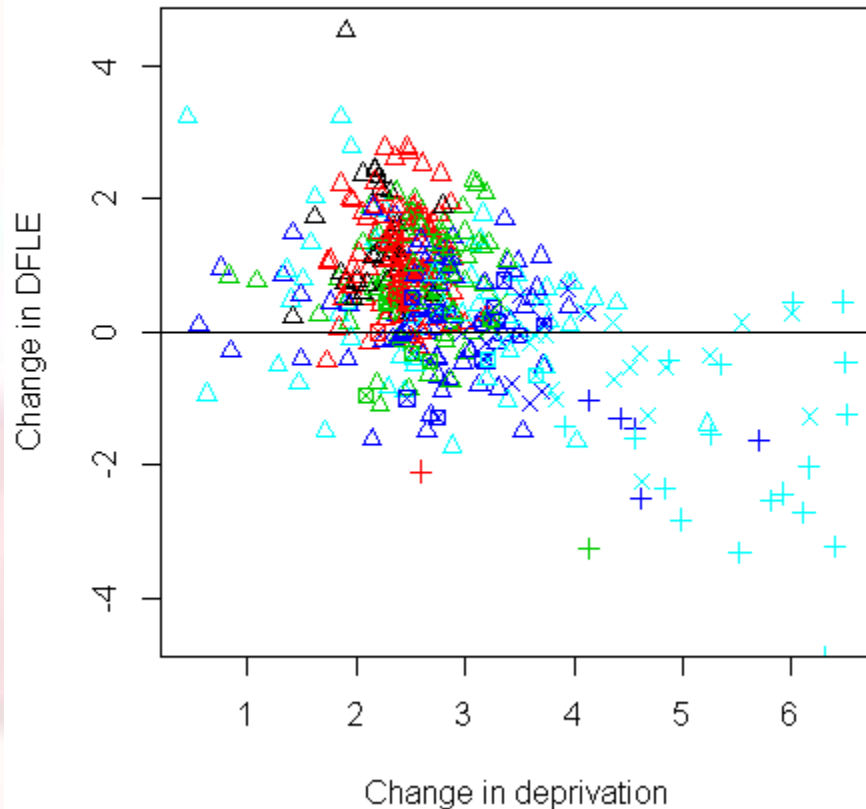
# Deprivation and LE / DFLE



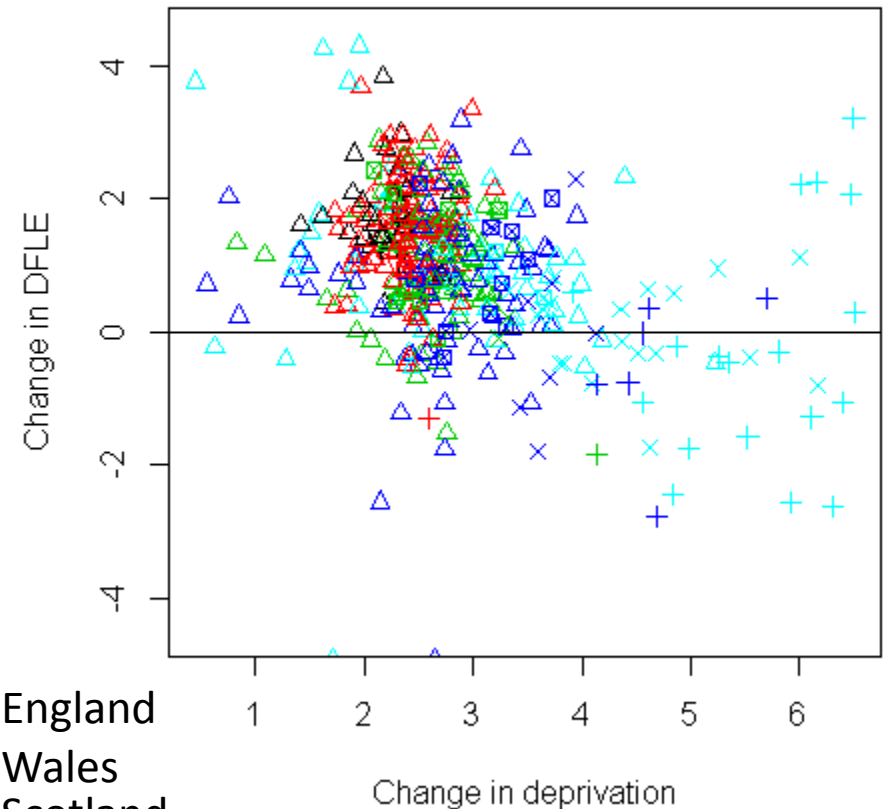
Year	Gender	Age	Variable	r <sup>2</sup>	Slope	p	Year	Gender	Age	Variable	r <sup>2</sup>	Slope	p
1991	Men	at Birth	DFLE	0.44	-0.62	***	2001	Men	at Birth	DFLE	0.60	-0.81	***
			LE	0.46	-0.36	***				LE	0.59	-0.37	***
	Women	at Birth	DFLE	0.40	-0.51	***		Women	at Birth	DFLE	0.61	-0.73	***
			LE	0.23	-0.20	***				LE	0.39	-0.24	***

# Does change in deprivation explain changes in DFLE

Women at birth



Men at birth

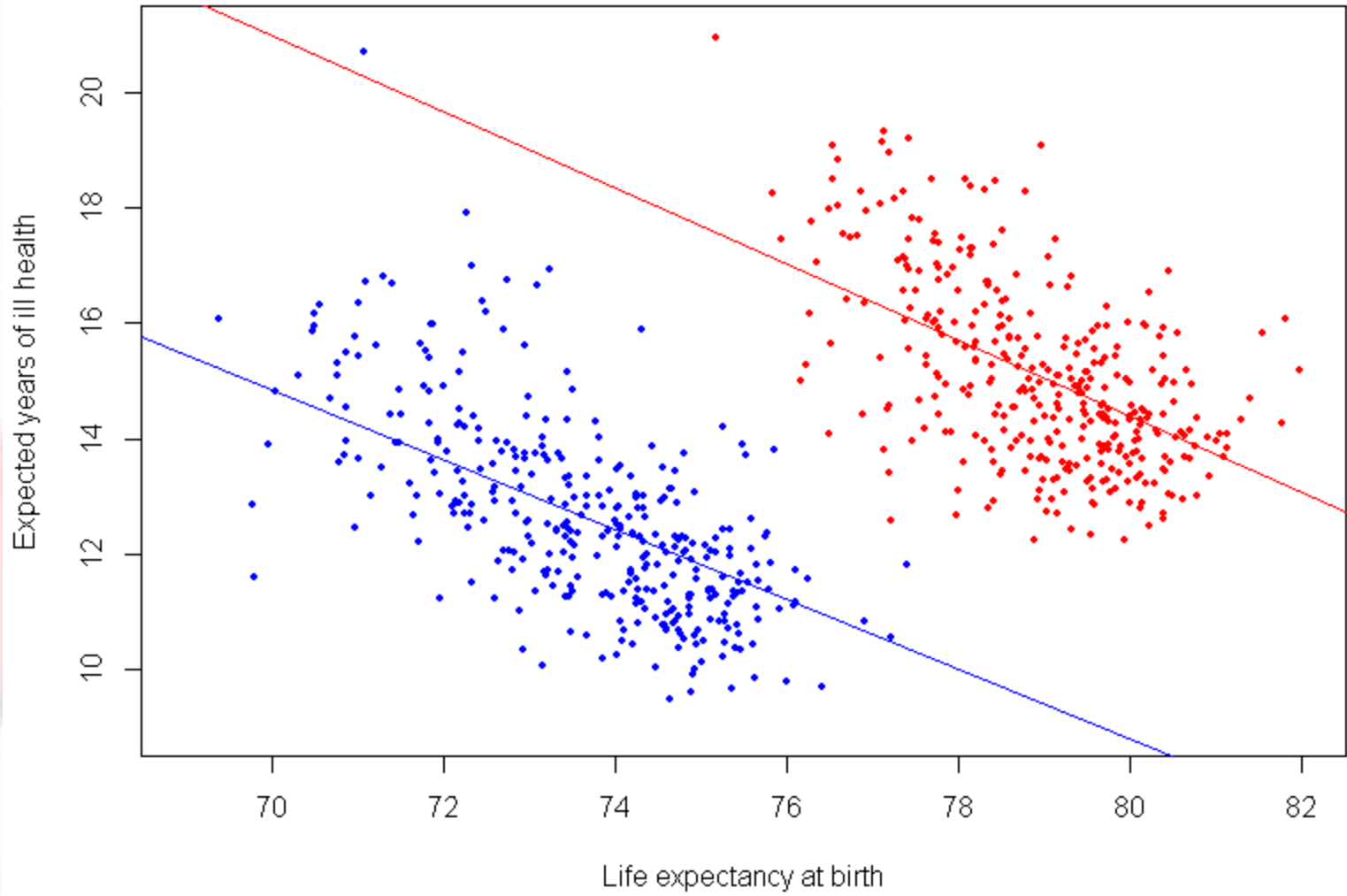


- △ England
- Wales
- × Scotland
- + Northern Ireland

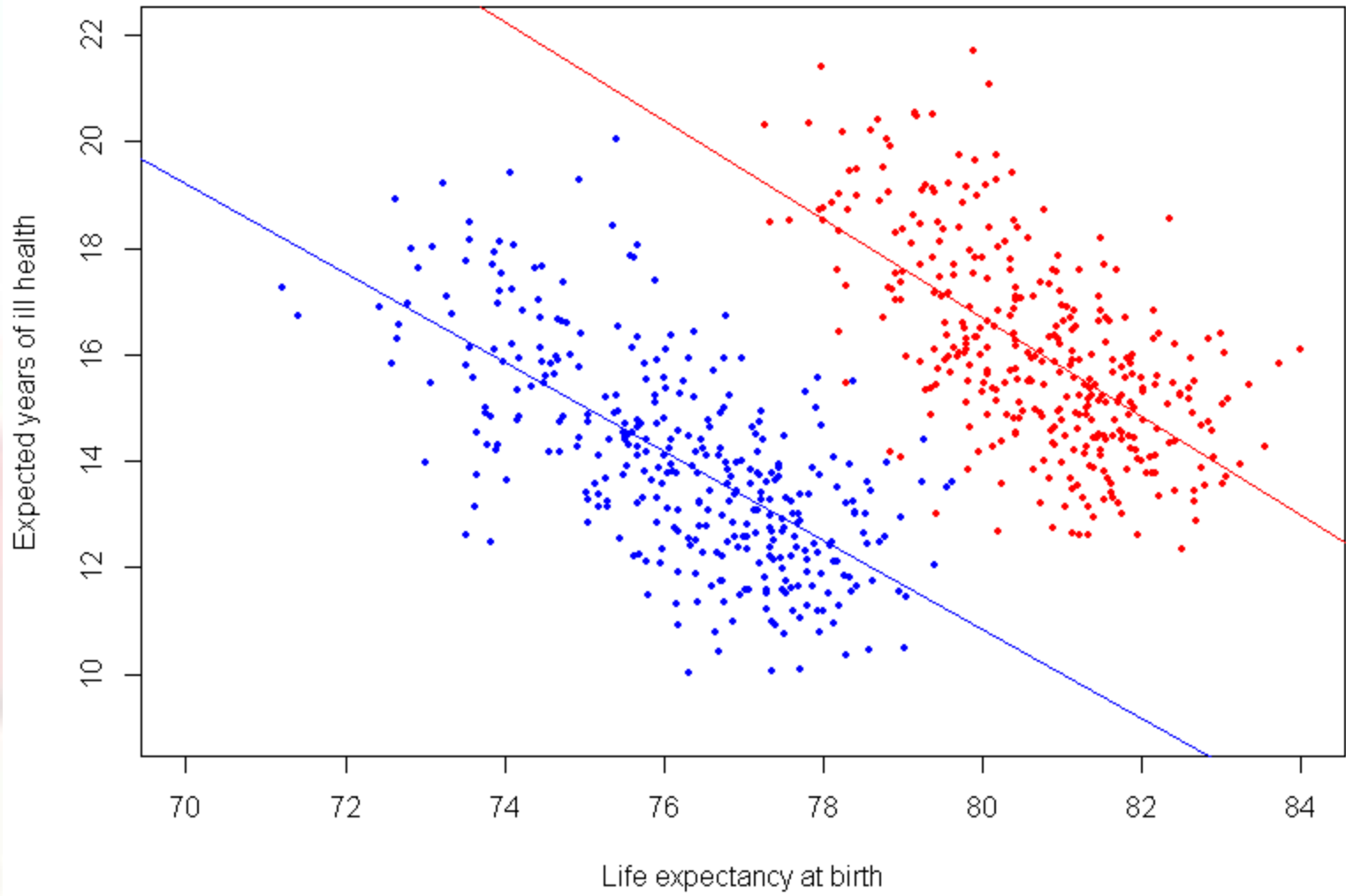
Norman P (2010) Identifying change over time in small area socio-economic deprivation. Applied Spatial Analysis and Policy 3(2-3) 107-138



### Men and Women 1991



### Men and Women 2001





# Factors affecting DFLE of local areas 2001 (E&W)

Factors	DFLE Men				DFLE Women			
	Regression coefficient	Standard error	Beta coefficient	Significance	Regression coefficient	Standard error	Beta coefficient	Significance
Social Class IV and V (%)	-0.34	0.02	-0.61	***	-0.34	0.02	-0.68	***
Unemployment Rate (%)	-0.64	0.08	-0.36	***	-0.39	0.08	-0.24	***
Population Sparsity	-0.02	0.01	-0.10	**	-0.01	0.01	-0.06	
Non-white Population (%)	0.05	0.01	0.12	***	0.00	0.01	0.00	
Constant	75.7				77.3			
R <sup>2</sup>	0.85				0.81			

# Conclusions

- Data adjustment for 1991 data works well
- Ranges and dispersion measures suggest increase in inequality in DFLE between 1991 and 2001. For population deprivation quintiles, tracked through time, the increase in DFLE in the least deprived quintiles was larger than in the most deprived quintile. The “new” middle quintiles have lower DFLE in 2001 compared to 1991
- In most local areas DFLE and LE at birth increased, but with the increase in LE larger than DFLE.
- at age 85+ also many areas that experienced decrease in LE and DFLE. In areas with increase, LE increase much steeper than DFLE increase.
- Expansion of morbidity? (caution, LA data!)
- Decrease in deprivation does not seem to have affected DFLE
- Especially for women in Scotland and Northern Ireland a decline occurred with improved deprivation.

# Conclusions

- Local areas in Scotland and Northern Ireland had less favourable development between 1991 and 2001, both for LE and DFLE and for women at birth and age 85+
- Clear decrease of DFLE at birth from rural to urban setting, but for the oldest old, living in urban areas seems to have advantages.
- Townsend deprivation index does not explain variation in DFLE for the oldest old, but well for other ages.
- Steeper decline in DFLE and LE with deprivation in 2001 and deprivation explains more of the variation in 2001 than in 1992
- The gap in DFLE between urban and rural areas is lower than the gap we see for deprivation quintiles.
- At age 85+ men seem to have higher DFLE compared to women
  - different reporting of health at this age group
  - more women still reach older ages, different composition of both groups with more disability in women because of different age structure.

Inequalities in

**I**n **H** **A** **L** **E**

Healthy Active

Life

Expectancy

# Health expectancies in ethnic groups



# Research question

- How do health expectancies vary for ethnic groups in England and Wales and are the observed differences significant?

# Results

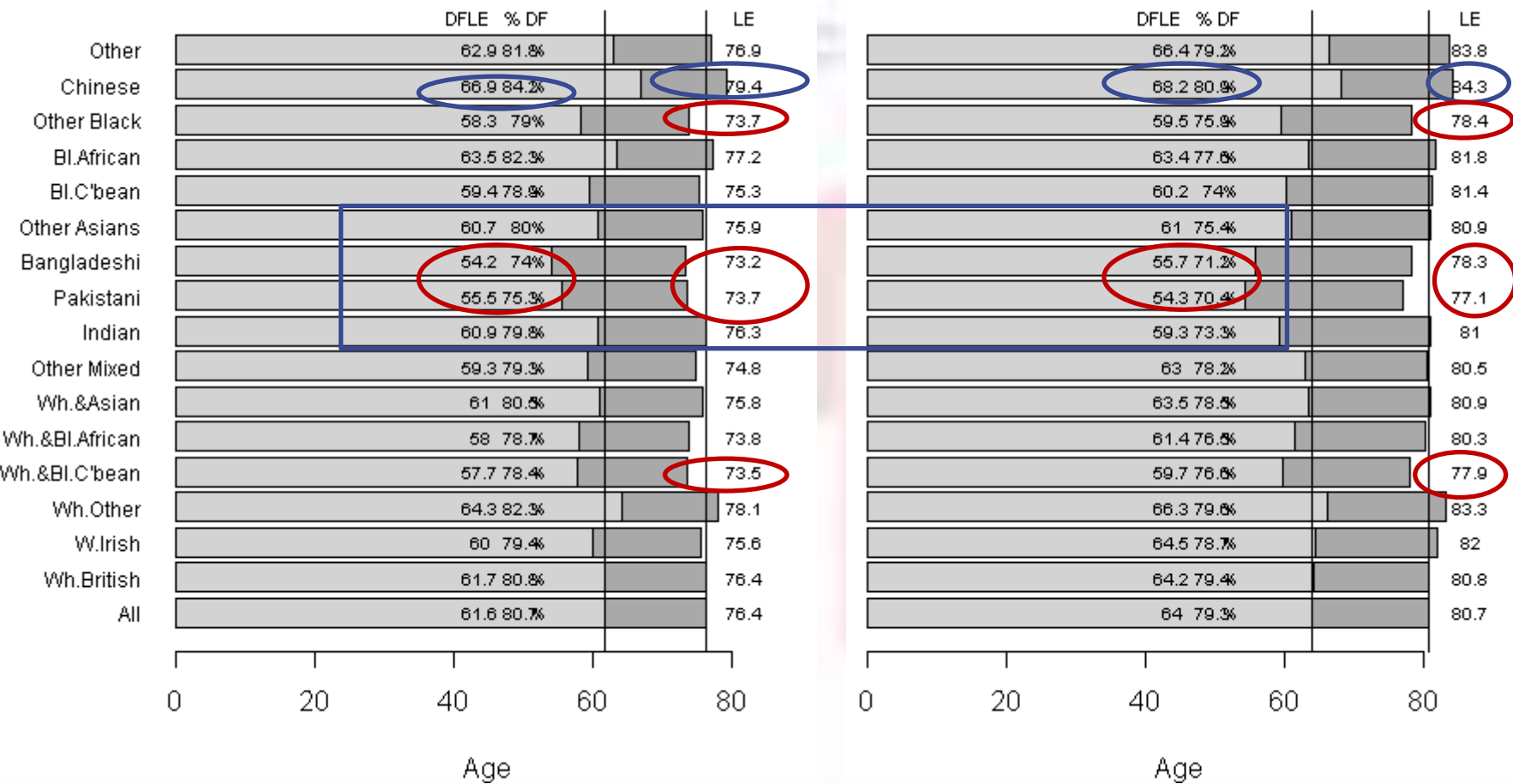
## LE, DFLE across 16 ethnic groups



# at birth

Highest LE, DFLE and HLE for Chinese men, lowest for in Pakistani and Bangladeshi group. Even though LE of Wh.&Bl.C'bean and Other Black similar low, more time spend without disability and in good/fair health.

Women have higher LE, DFLE and HLE compared to men, with exceptions in some Asian groups. Pattern of variation between groups are similar to the once observed in men. Women spend more time with disability/ Not good health compared to men.



# Results

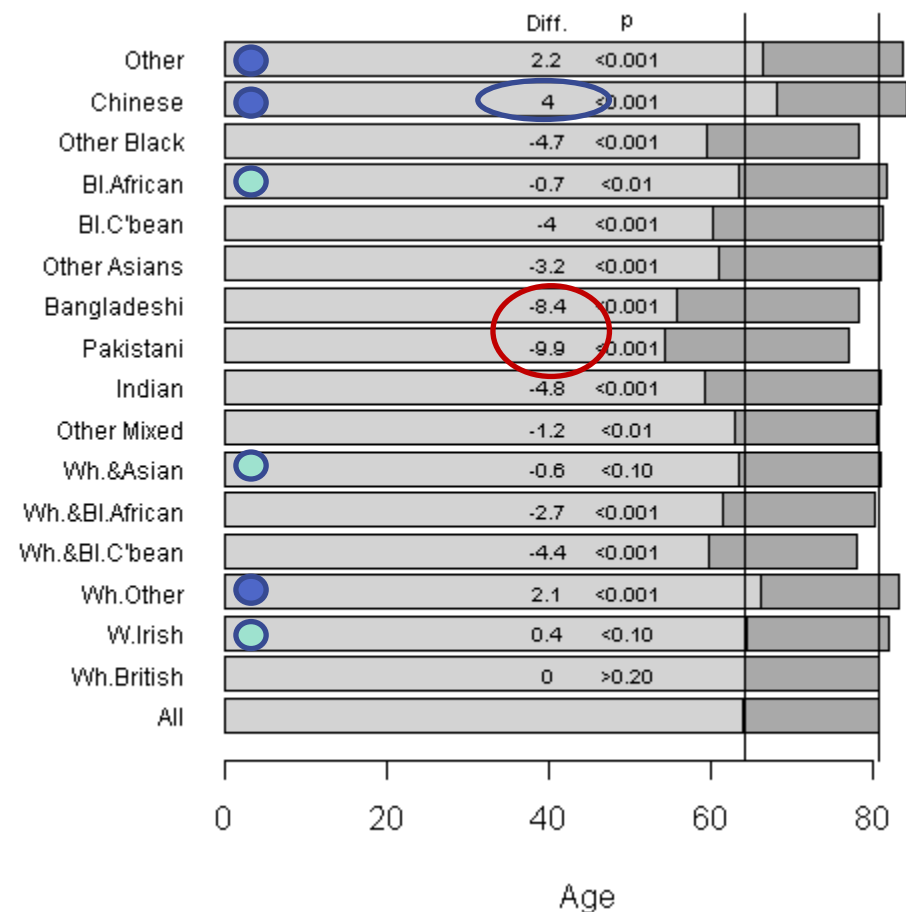
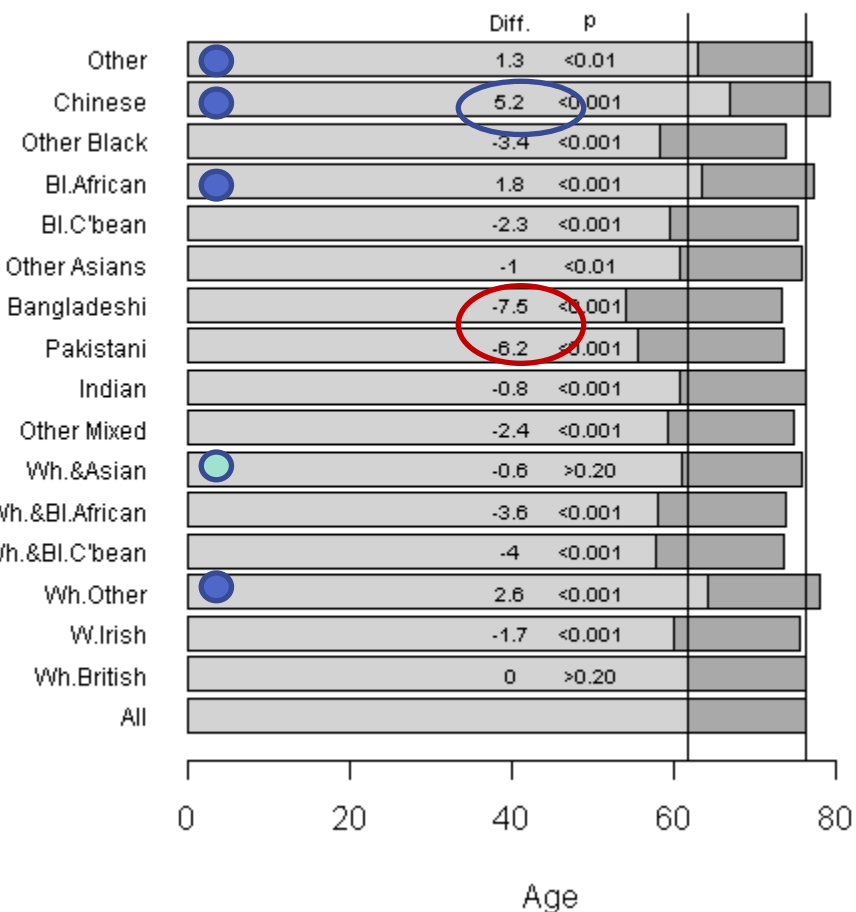


# at birth

## Differences in DFLE between Wh.British and other groups

White Other, Black African, Chinese and Other groups have significantly higher DFLE and HLE Compared to the White British group. Especially Bangladeshi and Pakistani groups have significantly lower health expectancies.

Similar to men, great differences between the White British (WBR) group and the Pakistani and Bangladeshi group. No significant difference between the White Irish (WIR) women and WBR women, whereas WIR men have sig. lower health expectancies.



# Results



LE, DFLE across 16 ethnic groups

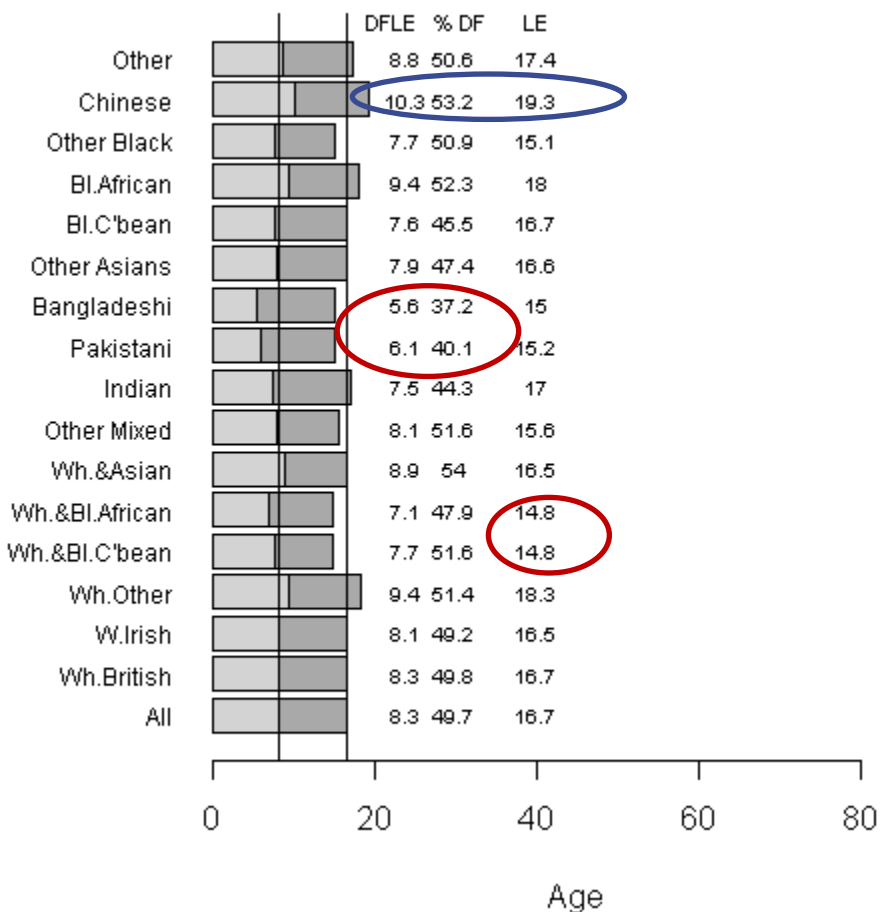
White & Black African and White & Black Caribbean have lowest LE.



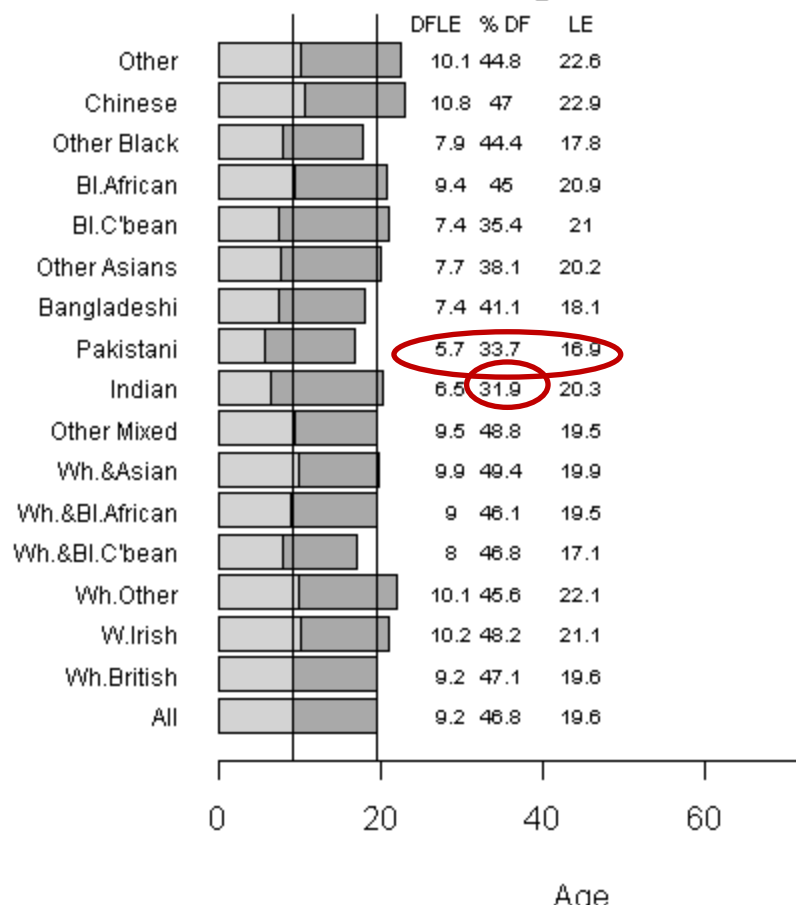
# age 65

Lowest LE, DFLE and HLE for Pakistani women. Even though Indian women have higher LE and DFLE, they spent only ~32% without LLTI.

**Men age 65 DFLE/LE**



**Women age 65 DFLE/LE**





# Results

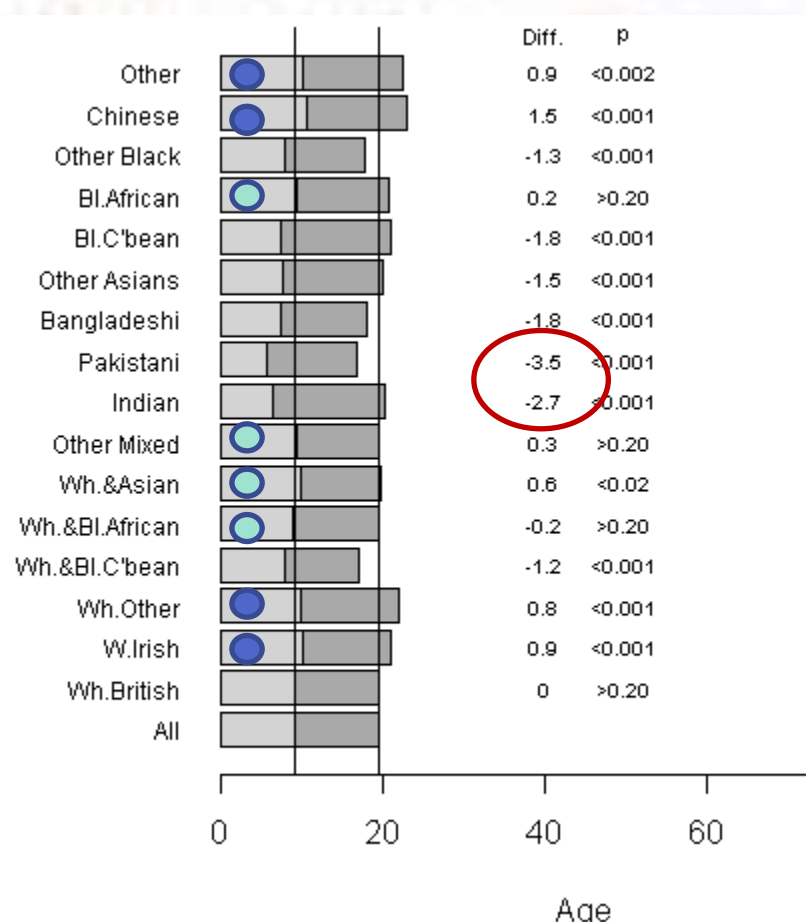
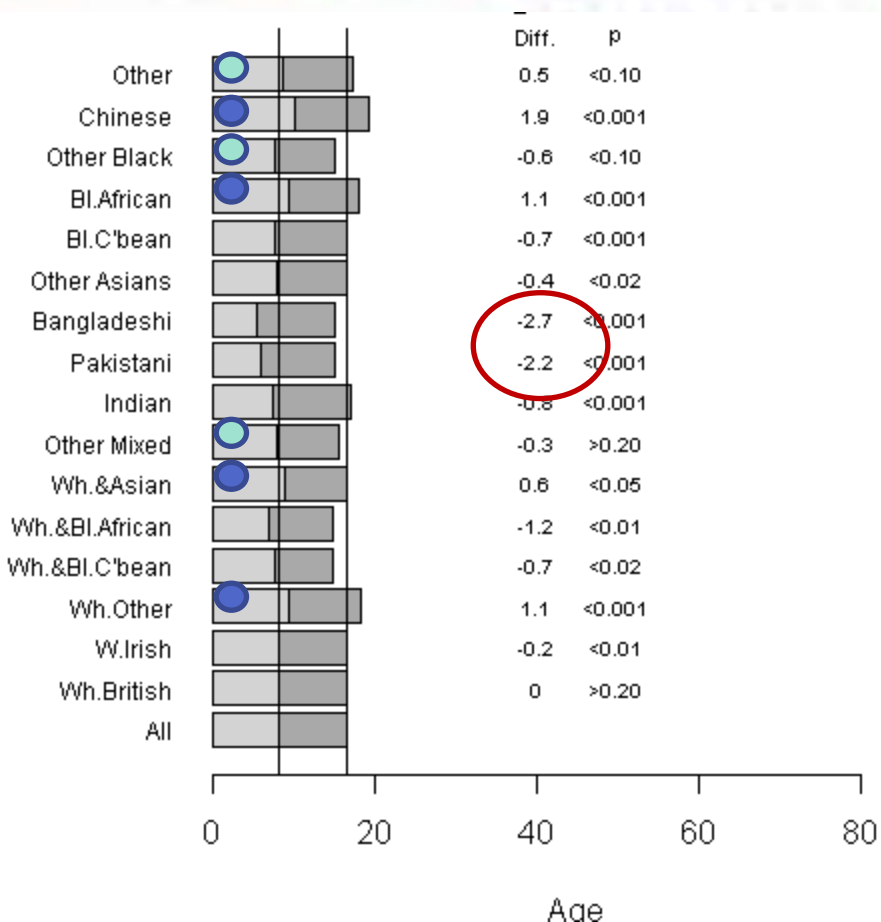


# age 65

## Differences in DFLE between Wh.British and other groups

Other Black men and White & Asian men: variation in significance of differences between DFLE and HLE.

Older ages, White Irish Women sig. better health expectancy than White British Women. Black African, Other Mixed, White & Asian and White & Black African women no difference to White British women DFLE and HLE as well (except Black African).



# Conclusions

- Life and health expectancies differ considerably between ethnic groups
- Some minority groups have better health than the majority, some have lower
- For men at birth
  - highest LE is for Chinese men 79.4
- lowest for Bangladeshi men (73.2) closely followed by Pakistani men (73.7)
- This pattern is similar for health expectancies, where Chinese men can expect to live most years without a disability and in fair / good health and Pakistani and Bangladeshi men the fewest years.
- Similar patterns are seen at other ages and in women.

# Conclusions

- In most instances the observed differences between a minority ethnic group and the White British group are significant.
- Differences are in both directions
- Mostly differences in DFLE and HLE between an ethnic group and the White British group follow the same direction with the exception of White Irish and Black African Women
- DFLE and HLE do not always follow the pattern of LE, groups with same/similar LE can vary considerably in health expectancy
- In general women have higher LE and health expectancies compared to men, but can expect to spend more % of their life time with a limiting long term illness or in not good health. In some Asian groups women have lower DFLE compared to their male counterparts.

# Summary

- We find pronounced health inequalities across UK local areas and inequality seems to have increased between 1991 and 2001, less deprivation has not reduced inequality.
- Like other studies, this study also suggests that attempts to reduce inequality in the UK were not successful between 1991 and 2001. Also need to focus on Scotland and Northern Ireland
- Significant differences in health expectancies for different ethnic groups, affirms health inequality between ethnic groups and the importance to fine tune groupings. But not all minority groups have worse health compared to the majority population.
- Health expectancy adds information studying mortality inequality does not deliver
- It would be good to have actual mortality data for ethnic groups
- We also would need a better understanding on possible differences in self reporting on health for different ethnic groups

# Acknowledgements

Carol Jagger

Phil Rees

Alan Marshall

Paul Norman

