Social Research with Quantitative Methods

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Q-Step Director

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Exercise 1: Life expectancy calculator

- Use one of the links below to calculate your life expectancy:
- https://www.bbc.co.uk/news/health-44107940

- Calculate your life expectancy…….
- Discuss the result with whoever is next to you

- Fill out the questions in exercise 1

What is life expectancy?

Life expectancy

- A measure of the number of years a person of a given age in a population can be expected to live based on the age-specific mortality rates for that population
- Age specific mortality rate is simply the number of deaths at a particular age divided by the population at that age
- Life expectancy can be calculated for any age, but the most commonly used is **Life Expectancy at Birth**
- Typically this is the number of years a new born would be expected to live if they experienced the **current** age-specific mortality rates over the course of their life
- Usually calculated separately for men and women reflecting their different mortality experience

Life expectancy across the World!

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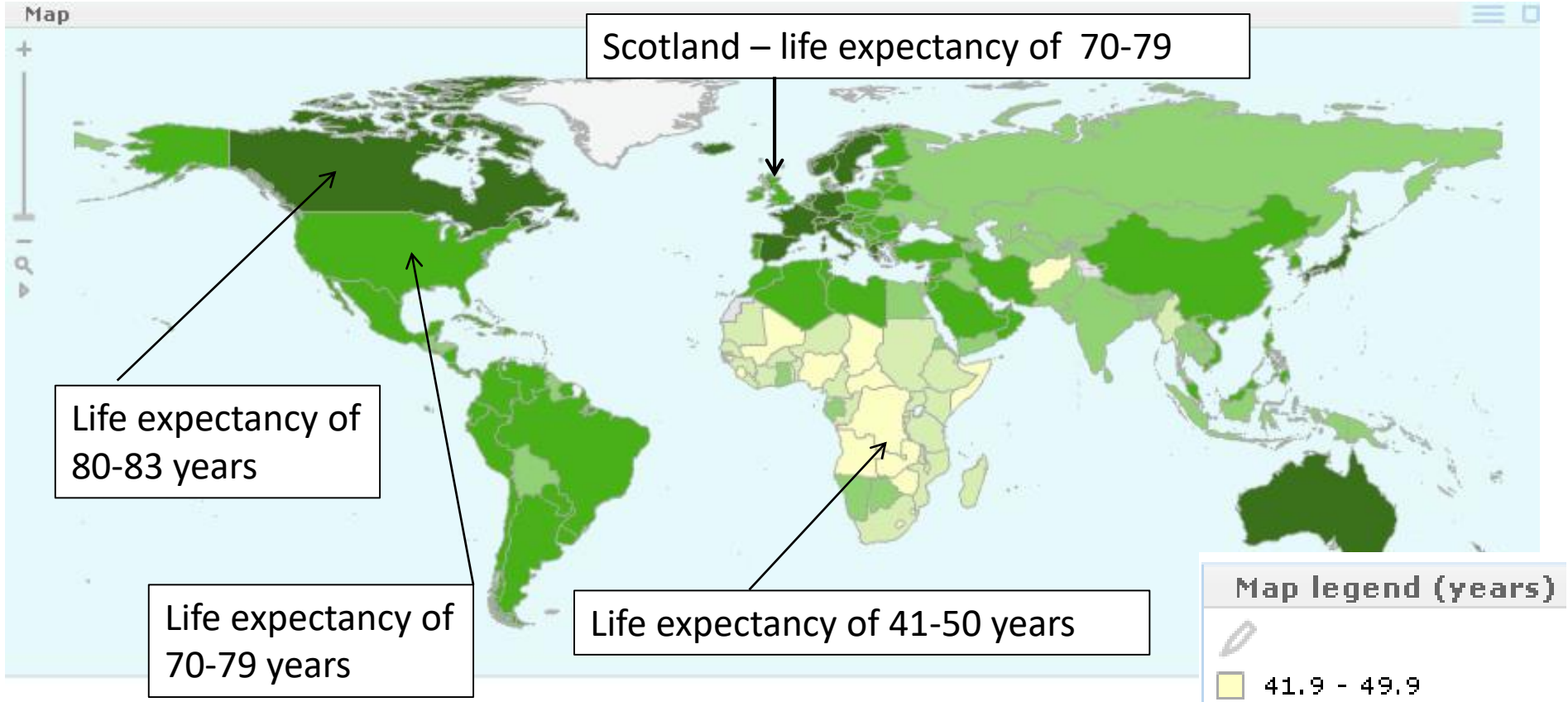

Life expectancy

Extremes

- Japan (2008) m=78.7 f=85.6
- Zambia (2008) m=38.5 f=38.7

- Some key advantages of life expectancy as a mortality measure
  - It is age standardised and so can be used as a basis for comparing populations.
  - Life expectancy at birth provides a single figure summary of a populations mortality experience.

- Most countries have experienced major improvements in life expectancy over the last century. The main factor initially is a reduction in the level of infant mortality. For developed countries, more recent improvements have come through a decline in mortality at oldest ages.

- Exercise 2: Using a life table to explore life expectancy

What is a life table?

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- Life tables are based on the probability of dying between one age & the next age

- We **create a hypothetical cohort of new-borns (usually 100,000) and then ageing them and subjecting them to the current age specific mortality rates** until they are all dead.

- Life tables consist of a set of columns – most of these can be calculated from any other.
- **The only raw data required are a set of Age-Specific Mortality Rates (ASMRs)**
- The columns of the lifetable provide some very useful information

Life table calculations

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Exact age 4				
Exact age 3				98,959
Exact age 2			99,008	
Exact age 1		99,092		
Exact age 0	100,000			
	Year 1	**Year 2**	**Year 3**	**Year 4**

Apply mortality rates
To reduce initial cohort from 100,000 to 0

On the way to calculating a life table we can access some other very useful information including:

The number of people still alive at a particular age
The number of people who died between two ages
The probability of surviving between two age (probabilities vary between 0 and 1)

A life table shows all the above information and is a wealth on information!

ONLY DATA REQUIRED

Period Abridged Life Table: England &Wales 2001 (males)

Age	Age interval	Age Specific Mortality Rate	Average proportion of period x to x+n lived by those who die	Probability of dying between exact ages (x & x+n)	Probability of surviving between exact ages (x & x+n)	Persons alive at exact age x	No. of deaths between exact ages (x & x+n)	No. of person years lived between exact ages (x & x+n)	Total no. of person years left to live after exact age x	Life expectancy at exact age x
x	n	$_nM_x$	$_na_x$	$_nq_x$	$_np_x$	l_x	$_nd_x$	$_nL_x$	T_x	e_x
0	1	0.006020				10000				
1	4	0.000254								
5	5	0.000111								
10	5	0.000180								
15	5	0.000557								
20	5	0.000792								
25	5	0.000934								
30	5	0.001119								
35	5	0.001329								
40	5	0.001883								
45	5	0.003062								
50	5	0.004661								
55	5	0.007789								
60	5	0.012834								
65	5	0.021083								
70	5	0.036263								
75	5	0.061474								
80	5	0.096576								
85	infinite	0.187934								

Age 1 to 5 (1+4)

Deaths / Population
0.5 – half pop died
85+ rate is 0.1879 (18%)

Radix: initial population

All dead!

ONLY DATA REQUIRED

Period Abridged Life Table: England &Wales 2001 (males)

Age	Age interval	Age Specific Mortality Rate	Average proportion of period x to x+n lived by those who die	Probability of dying between exact ages (x & x+n)	Probability of surviving between exact ages (x & x+n)	Persons alive at exact age x	No. of deaths between exact ages (x & x+n)	No. of person years lived between exact ages (x & x+n)	Total no. of person years left to live after exact age x	Life expectancy at exact age x
x	n	$_nM_x$	$_na_x$	$_nq_x$	$_np_x$	l_x	$_nd_x$	$_nL_x$	T_x	e_x
0	1	0.006020		0.005988		10000				
1	4	0.000254		0.001017						
5	5	0.000111		0.000555						
10	5	0.000180		0.000897						
15	5	0.000557		0.002782						
20	5	0.000792		0.003954						
25	5	0.000934		0.004660						
30	5	0.001119		0.005582						
35	5	0.001329		0.006622						
40	5	0.001883		0.009372						
45	5	0.003062		0.015191						
50	5	0.004661		0.023038						
55	5	0.007789		0.038200						
60	5	0.012834		0.062176						
65	5	0.021083		0.100138						
70	5	0.036263		0.166242						
75	5	0.061474		0.266424						
80	5	0.096576		0.388968						
85	infinite	0.187934		1.000000		0				

etc

Probabilities applied to radix

All dead!

Probability – how likely something is
0 is impossible
1 is certain

Why is the final probability 1?

Because no one lives forever!

Period Abridged Life Table: England &Wales 2001 (males)

KEY MEASURE DERIVED

ONLY DATA REQUIRED

Abridged life table for MALES in England and Wales (2001)

Age	Age interval	Age Specific Mortality Rate	Average proportion of period x to x+n lived by those who die	Probability of dying between exact ages (x & x+n)	Probability of surviving between exact ages (x & x+n)	Persons alive at exact age x	No. of deaths between exact ages (x & x+n)	No. of person years lived between exact ages (x & x+n)	Total no. of person years left to live after exact age x	Life expectancy at exact age x
x	n	$_nM_x$	$_na_x$	$_nq_x$	$_np_x$	l_x	$_nd_x$	$_nL_x$	T_x	e_x
0	1	0.006020	0.1	0.005988	0.994012	100000	599	99461	7594213	75.94
1	4	0.000254	0.4	0.001017	0.998983	99401	101	397362	7494752	75.40
5	5	0.000111	0.5	0.000555	0.999445	99300	55	496363	7097390	71.47
10	5	0.000180	0.5	0.000897	0.999103	99245	89	496002	6601027	66.51
15	5	0.000557	0.5	0.002782	0.997218	99156	276	495090	6105025	61.57
20	5	0.000792	0.5	0.003954	0.996046	98880	391	493423	5609934	56.73
25	5	0.000934	0.5	0.004660	0.995340	98489	459	491298	5116511	51.95
30	5	0.001119	0.5	0.005582	0.994418	98030	547	488783	4625213	47.18
35	5	0.001329	0.5	0.006622	0.993378	97483	646	485801	4136431	42.43
40	5	0.001883	0.5	0.009372	0.990628	96837	908	481918	3650630	37.70
45	5	0.003062	0.5	0.015191	0.984809	95930	1457	476006	3168712	33.03
50	5	0.004661	0.5	0.023038	0.976962	94473	2176	466921	2692706	28.50
55	5	0.007789	0.5	0.038200	0.961800	92296	3526	452666	2225785	24.12
60	5	0.012834	0.5	0.062176	0.937824	88770	5519	430053	1773119	19.97
65	5	0.021083	0.5	0.100138	0.899862	83251	8337	395413	1343065	16.13
70	5	0.036263	0.5	0.166242	0.833758	74914	12454	343437	947652	12.65
75	5	0.061474	0.5	0.266424	0.733576	62460	16641	270700	604215	9.67
80	5	0.096576	0.5	0.388968	0.611032	45819	17822	184542	333515	7.28
85	infinite	0.187934		1.000000	0.000000	27997	27997	148974	148974	5.32

LE Birth=75.9

LE 65 = 75.9

Exercise 2: Analysing the life tables of Afghanistan and UK

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- Open the Excel spreadsheet ‘Life tables exercise’
- Follow the instructions in the worksheet
- Call me or one of the tutors over if you get stuck!
- Discuss the answers with the person(s) next to you and jot answers down on the worksheet

Exercise 2

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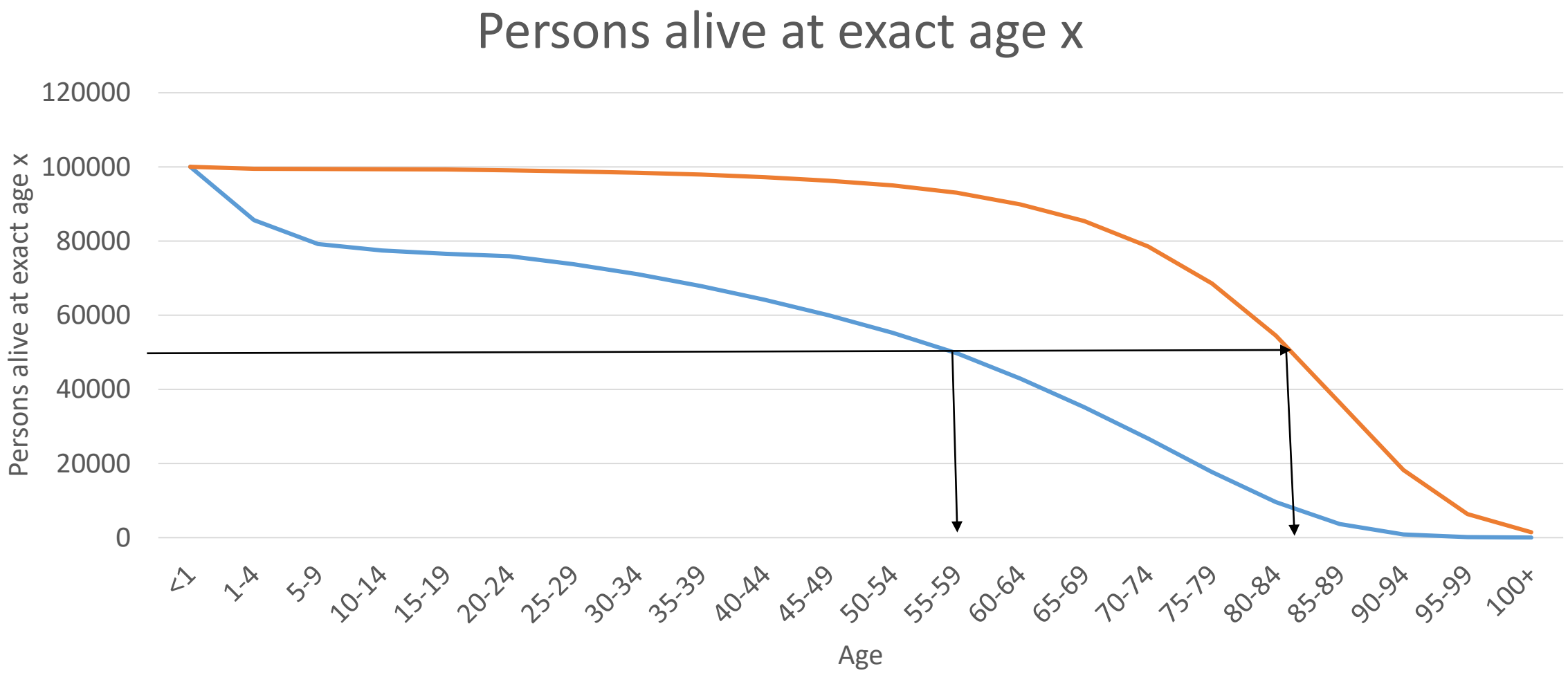
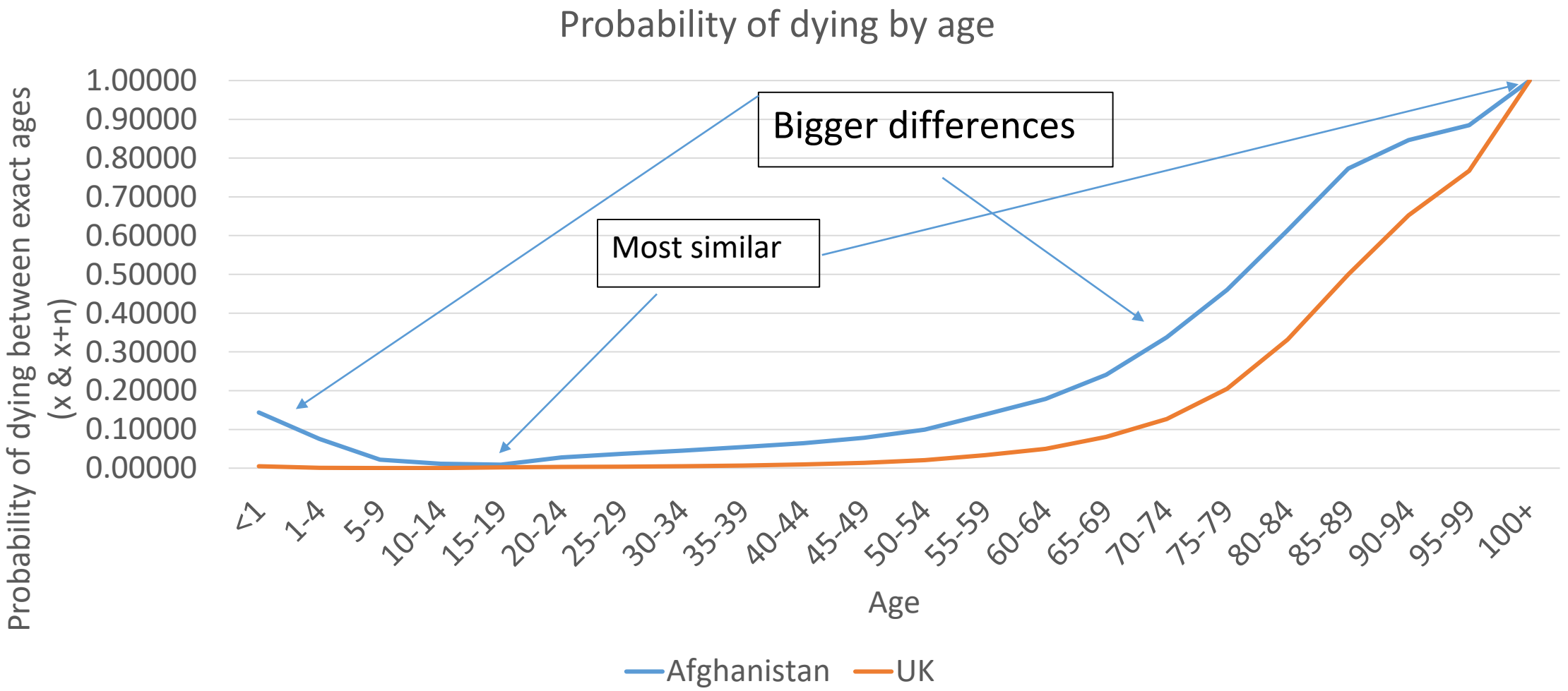
Life table statistic	United Kingdom	Afghanistan
Life expectancy at age 0	78.0	46.6
Life expectancy at age 1	77.4	53.3
How many of the original 10,000 people have died in the first year of life? Hint use column F	512	14,366
By which age have half the original cohort of 10,000 people died? Hint; use the Probability of dying graph	80-84	55-59
What is the probability of a baby dying in the first year of life? Hint; Use column D.	0.0051 (less than 1% chance)	0.1437 (14% chance)
What is the probability of a man dying at age 15? Hint; Use column D.	0.0023 (less than 1%)	0.0091 (less than 1%)

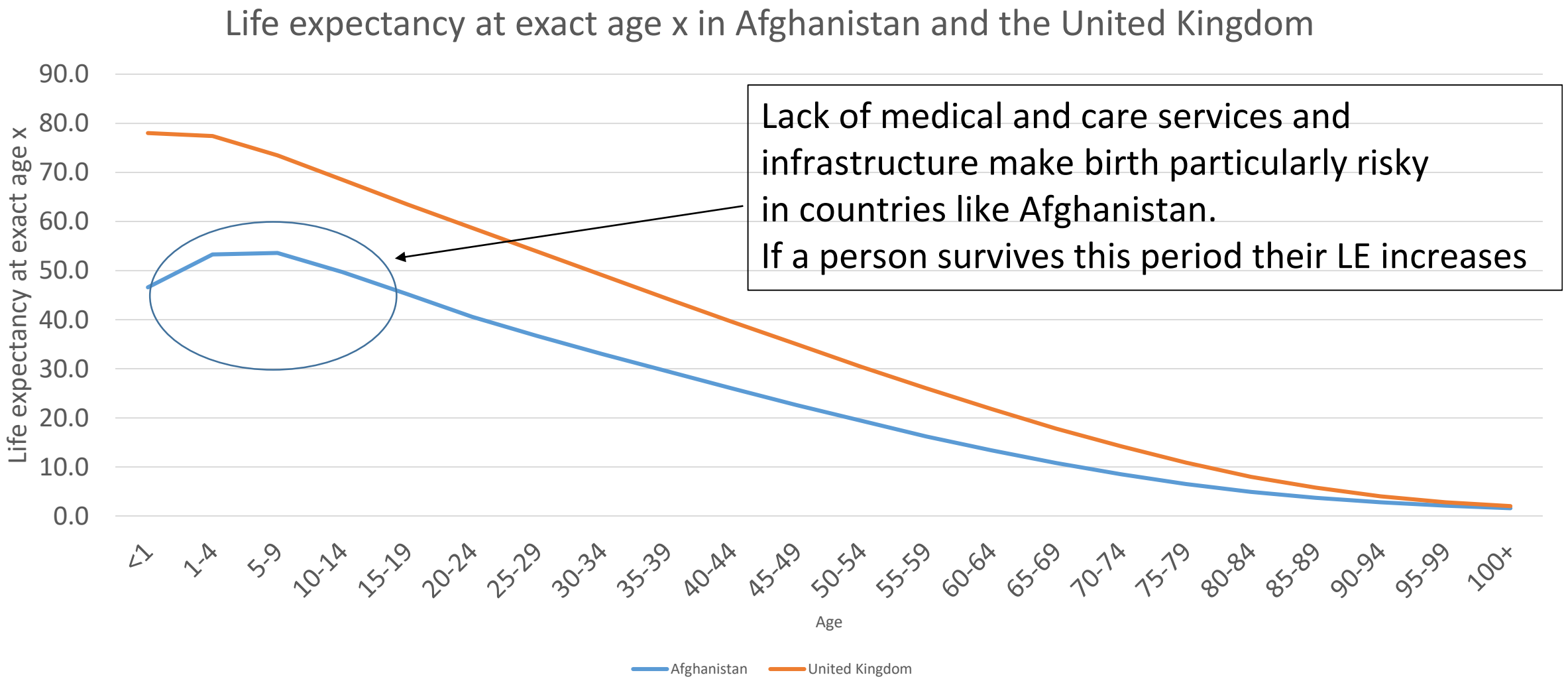
Age at which half the cohort have died



Probability of death by age



Life expectancy



Lack of medical and care services and infrastructure make birth particularly risky in countries like Afghanistan.
If a person survives this period their LE increases

Life expectancy

… is an average

-Most Afghans get older than 50

-Some die in childhood

… is low when child-deaths are common

-It is low in Afghanistan
not because all die a bit earlier

-But because
some die much younger

The 2016 data has male life expectancy at birth in the UK at 79.7 and in Afghanistan at 61. Does this mean babies born in 2016 will (on average) live to these ages?

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Health

10m alive in Britain today will live to be more than 100 years old

More than 10 million people alive today will live to be more than 100 years old, government figures suggest.

Experts said the rise in those aged over 100 years old has profound social, economic and financial implications Photo: RODGER TAMBLYN

Health
News » UK News »
Personal Finance »
Pensions »

World AIDS Day 2010

Life tables tell us average years of Life, IF…….

A baby experienced the mortality rates that we now observe….

Mortality rates have steadily fallen over the past two decades

If this continues we'd expect a baby born in 2016 to live beyond 79

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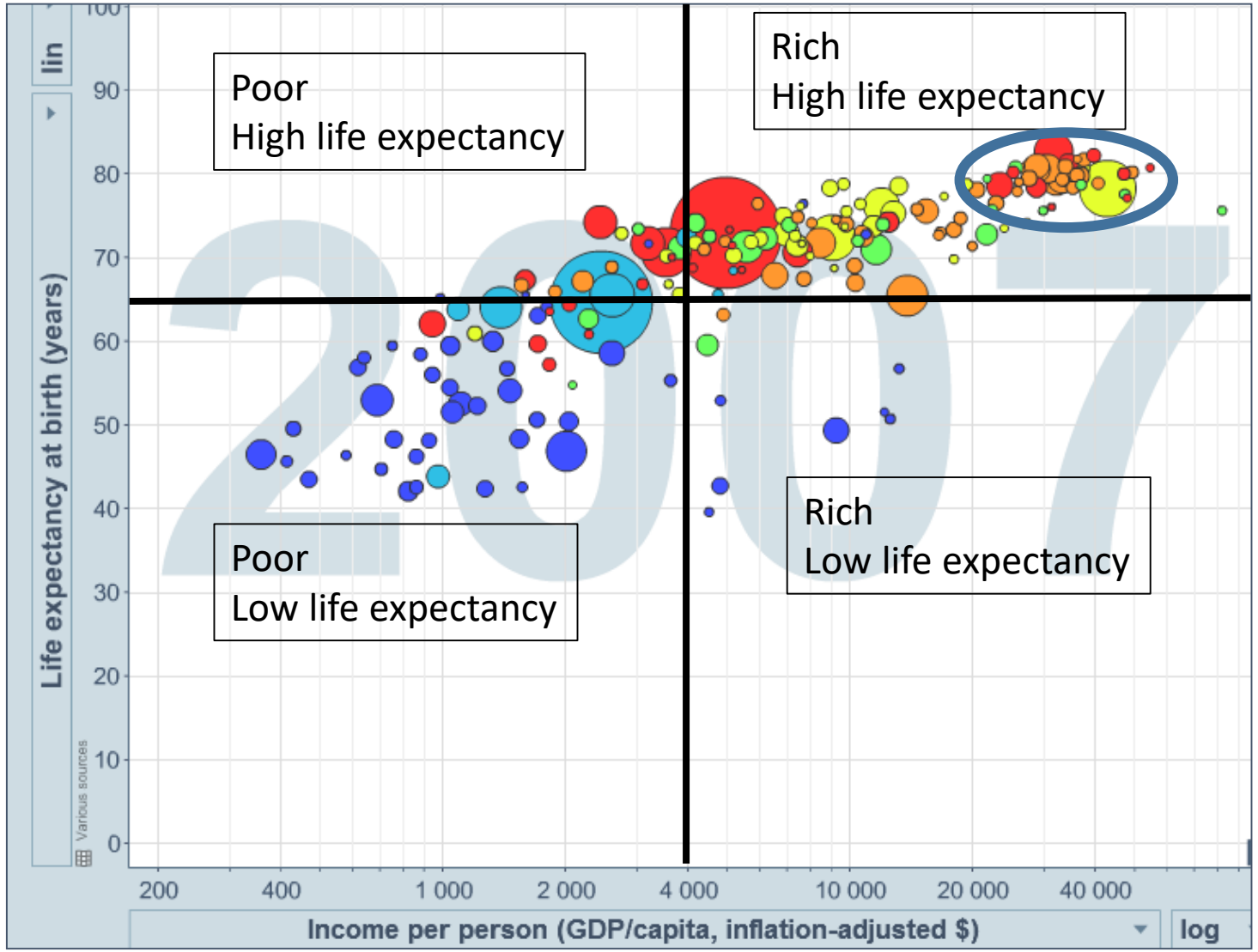
Life expectancy (years)



Income per person (comparable dollars per year)

Source Gapminder

Rising wealth goes together with rising life expectancy

Very few countries are:

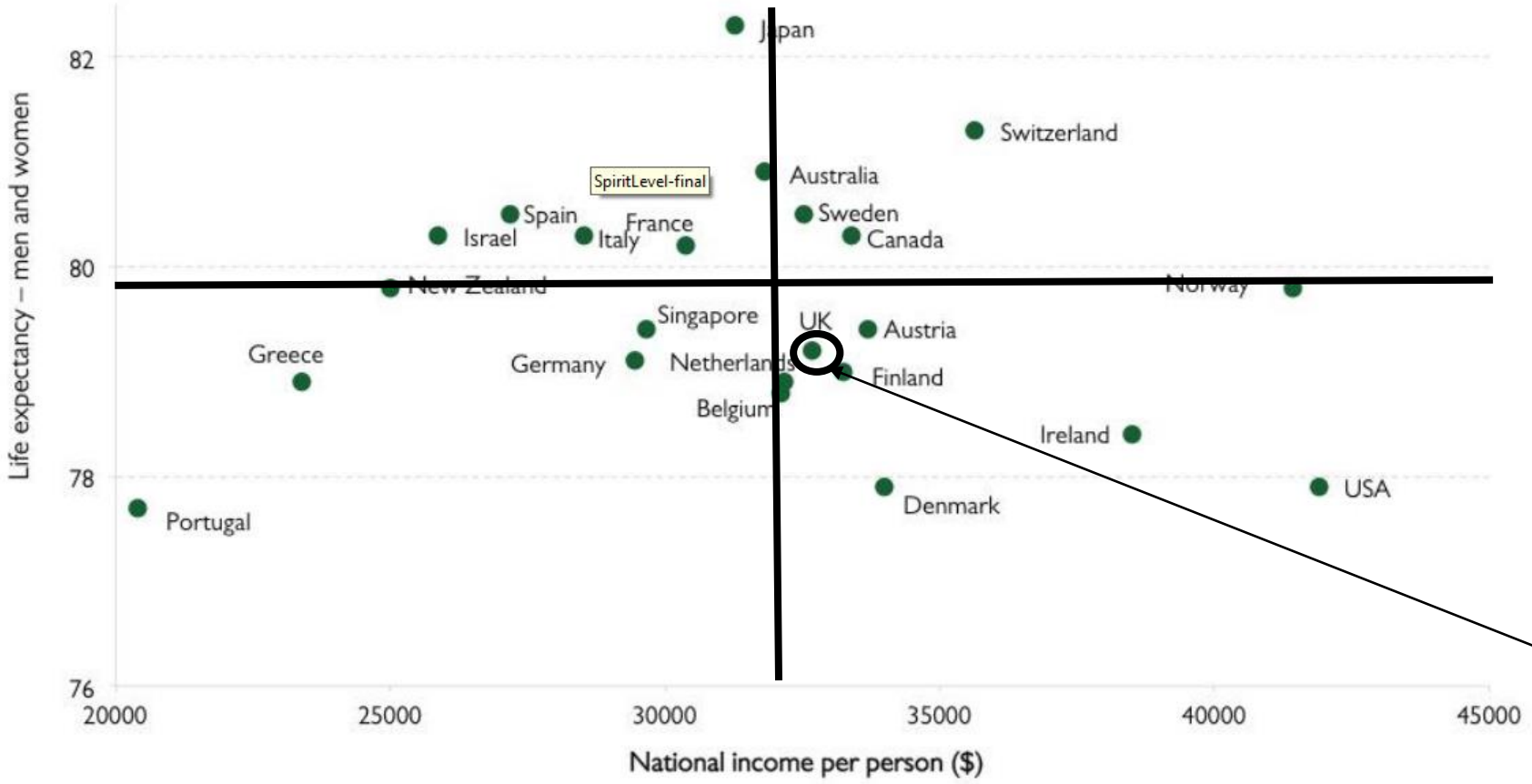
Poor with high life expectancy
Rich with low life expectancy

National wealth leads to:
Improved infrastructure
Better medical services
Increased access to foods

https://www.youtube.com/watch?v=jbkSRLYSojo

What about the most wealthy countries?

Health is not related to income differences between the richest countries



No clear pattern

Among the richest countries:

Richer have high and low Life exp
Poorer have high/low Life exp

Other factors involved……

How is health care provided?
Diet?
Social care in old age?

What about within the UK?

http://www.equalitytrust.org.uk/sites/default/files/attachments/resources/SpiritLevel-jpg_0.pdf

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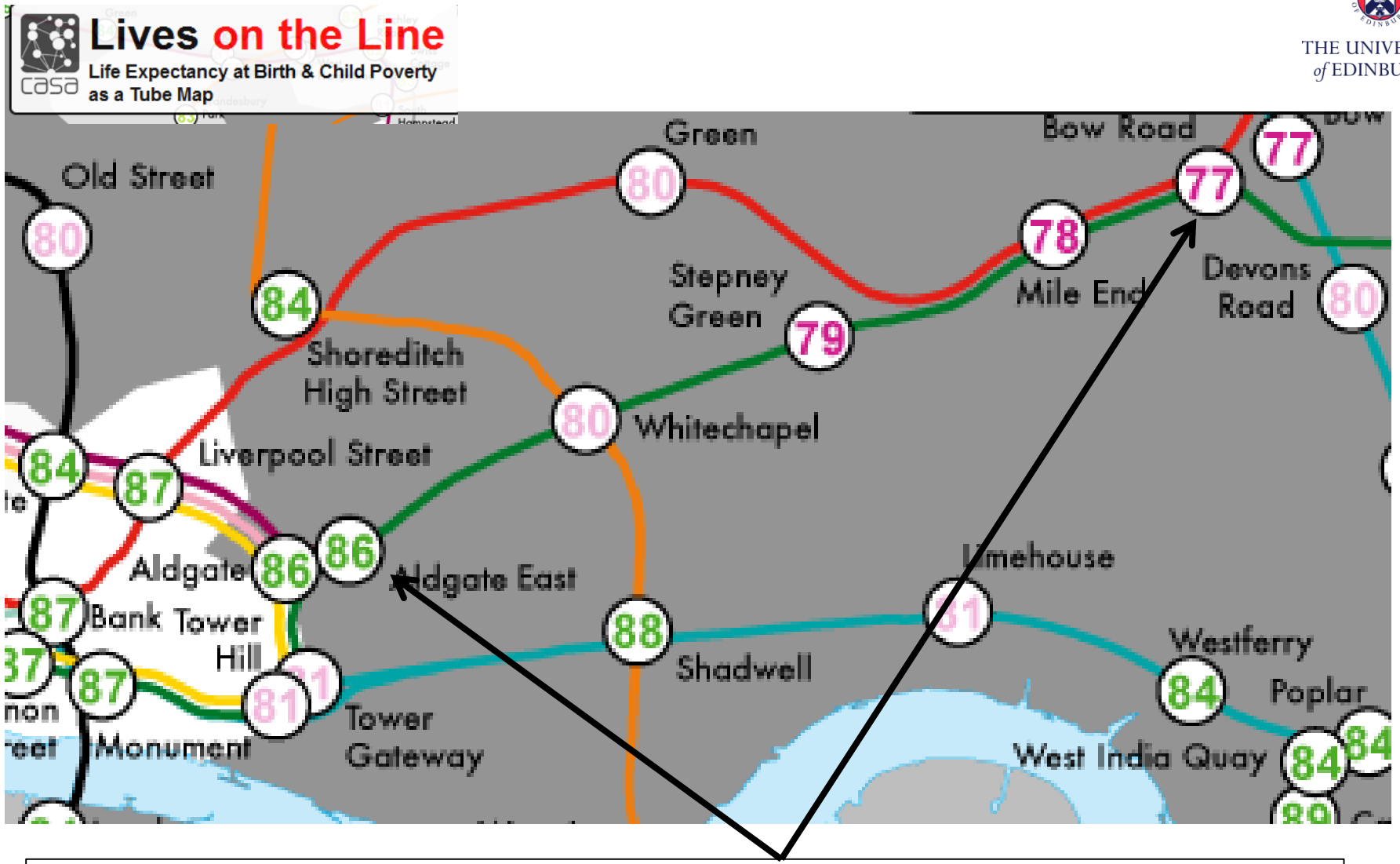
North-South divide's life expectancy gap now at a 40-year-high

AROUND 37,000 more people a year go to their graves early in the North compared with the South, a grim health report reveals today.

Tweet 0 Like 0 Send



Ten year difference in life expectancy travelling 4 stops on the District line

Cheshire, J. 2012. Lives on the Line: Mapping Life Expectancy Along the London Tube Network. *Environment and Planning A.* 44 (7). Doi: 10.1068/a45341.

Glasgow: health inequalities

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- Glasgow has particularly poor health outcomes relative to the UK and Europe
- And very strong inequalities; life expectancy of **54 in the Calton area** of Glasgow - 28 years less than that in **Lenzie (82)** a few miles away.

Red Road flats - Glasgow

Why do we see such stark inequalities in life expectancy in the UK?

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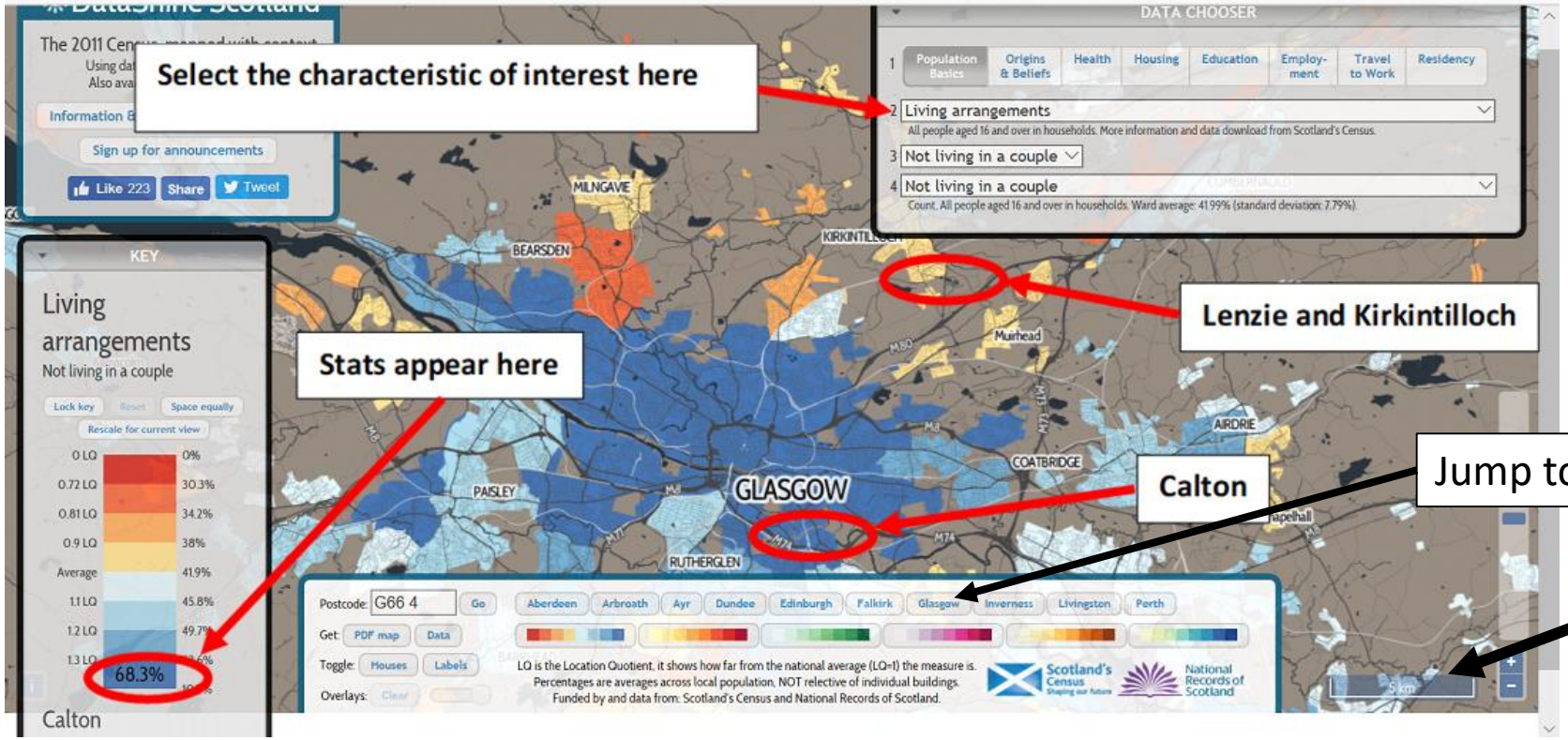
- Exercise 3 collects census data on Calton and Lenzie using Datashine Scotland.
- Follow the instructions on the worksheet and complete the questions



Exercise 3 results

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Characteristic	A: Lenzie and Kirkintilloch South (%)	B: Calton (%)
Population basics, Living arrangements, Not living as a couple	39.1	68.3
Population basics, Age structure, Mean age (average age)	42.1	36.8
Employment, Economic Activity, Economically active, Unemployed	3.8	7.5
Employment, National Statistics Socio-economic classification, Routine Occupations (this is unskilled work)	6.9	18.3
Employment, National Statistics Socio-economic classification, Higher Managerial and Professional Occupations	2.4	0.5
Housing, Tenure – households, Social Rented	11.3	51.9
Housing, Person per room – Households, Over 1.5 persons per room	0.3	0.9
Housing, Central heating, No central heating	0.9	4.9
Health, Long term health problem or disability, Day to day activities limited a lot	7.6	16.4

http://www.youtube.com/watch?v=KvwIW2dlUj8

- Andrew Marr: this is Britain (BBC)
- Discussion of the factors driving inequalities in life expectancy across markers of individual socio-economic position, behaviour and place

Why are there differences in life expectancy across the UK?

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- **Compositional factors (individual)**
  - Social and economic characteristics of the *individuals* living in particular areas influences health
  - Job, housing, wealth, lifestyle choices (exercise, smoking drinking), conditions in childhood

- **Contextual factors (area)**
  - A characteristic of the *area* (physical, economic or social environment) influences health

- Not mutually exclusive and some factors overlap (e.g. unemployment)

Context: Built environment, services, aesthetic quality

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Toxteth (Liverpool)
Life expectancy 69.5 (Males)

Kensington (London)
Life expectancy =85.1 (Males)

Availability of food

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Social statistics are **not** value-free

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"Statistics are pervasive and powerful, but often misleading or misunderstood, no more so than when they concern society"

Danny Dorling and Ludi Simpson

Simpson, L., Dorling, D. (1999) Statistics in Society: the arithmetic of politics. Hodder. London.

Theory as well as statistics are crucial to answering social research questions

Statistics in the media and in policy debates…..

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How to improve your heart health:

- Give up smoking
- Get active
- Manage your weight
- Eat more fibre
- Cut down on saturated fat
- Get your five a day fruit and vegetables
- Cut down on salt
- Eat fish
- Drink less alcohol
- Read labels on food and drink packaging

Source: **NHS Choices**

Predict ‘heart age’ using lifestyle choices
Secondary data – quantitative analysis
Q-Step degree allows you to replicate analysis!

Social statistics reflect the motives of the collector/analyst……..

Predict ‘heart age’ using **social circumstances**
Secondary data
Or better combine both social and lifestyle choices

How to improve you heart health:

- Earn more money
- Own your own house
- Avoid damp/cold housing
- Live in an affluent area
- Work in a rewarding job
- Avoid unskilled occupations
- Live with your partner/spouse
- Work in a permanent job
- Enjoy an active social life
- Make sure you have a pension

What next?

- Find out more about Q-Step and our degrees in the poster session and in the final talk!
- Extend the analysis you have undertaken today
  - Tips and resources on worksheet
- Submit a report (2 sides) to us by the end of the year
- Prize for the best report!