A novel methodology for constructing ethnic majority life tables: their importance for measuring inequalities in survival

Melanie Morris

Cancer Research UK Cancer Survival Group

London School of Hygiene & Tropical Medicine

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CANCER RESEARCH UK

National Cancer Action Team
Part of the National Cancer Programme

DH Department of Health

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Inequalities in survival – the importance of background mortality (using the right life table)

"…it is critical to **use sub-population life-tables** for estimating relative survival when those sub-populations have **marked variation in background mortality rates**. However, often only sex-specific life-tables are used."

Blakely T et al (2012). Bias in relative survival methods when using incorrect life-tables: lung and bladder cancer by smoking status and ethnicity in New Zealand. *International journal of cancer* **131**(6)**:** E974-82

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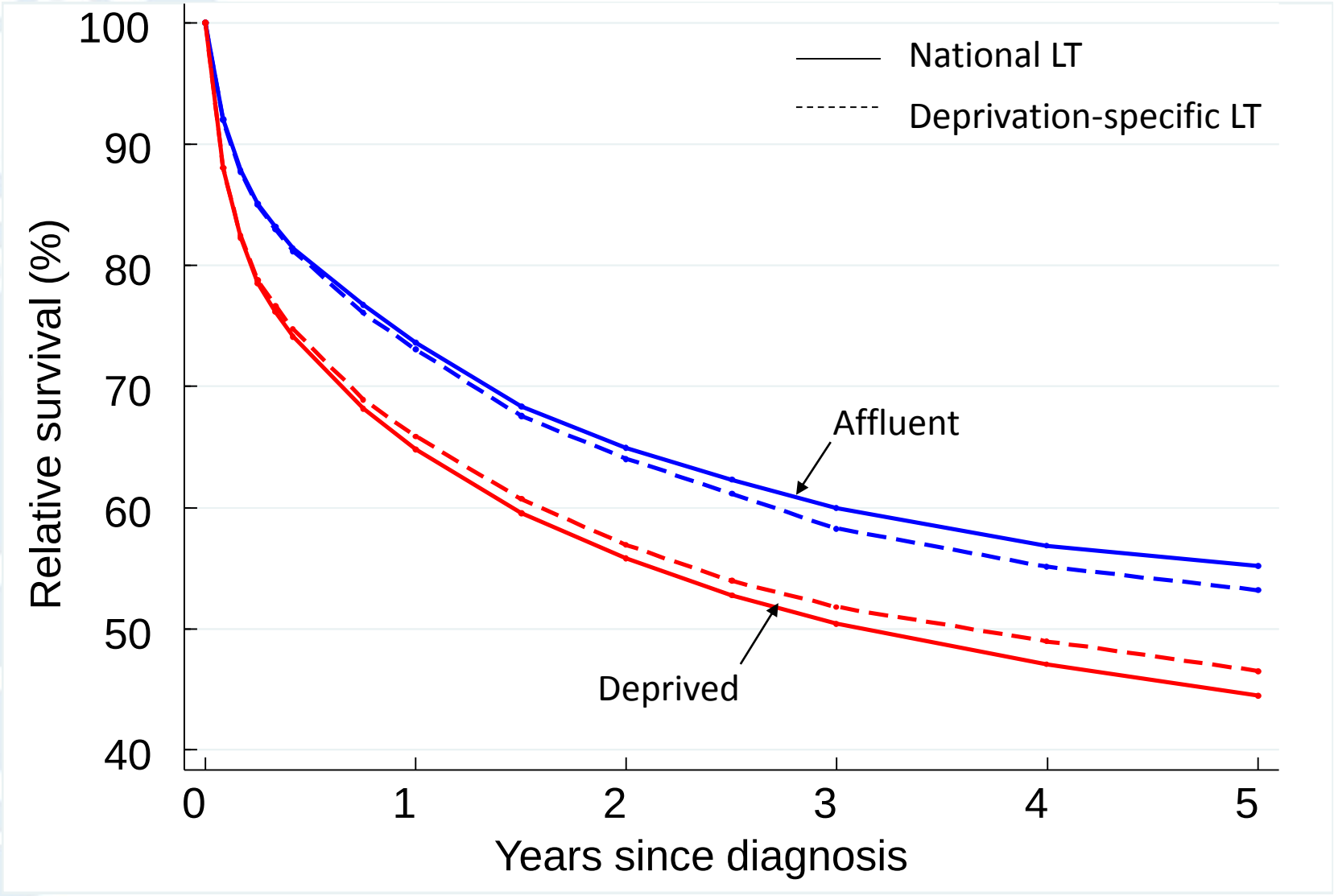
Inequalities in survival – the importance of background mortality (using the right life table)



Life tables examine mortality by age and sex

Age	Deaths	Population	Mortality Rate	Life expectancy
0	1327	279.8	0.00474	80.9
1	99	272.0	0.00037	80.3
2	57	272.4	0.00021	79.4
3	40	278.8	0.00015	78.4
4	40	286.1	0.00014	77.4
…				

Derived from the interim life table for England and Wales 2003, females, www.gad.gov.uk

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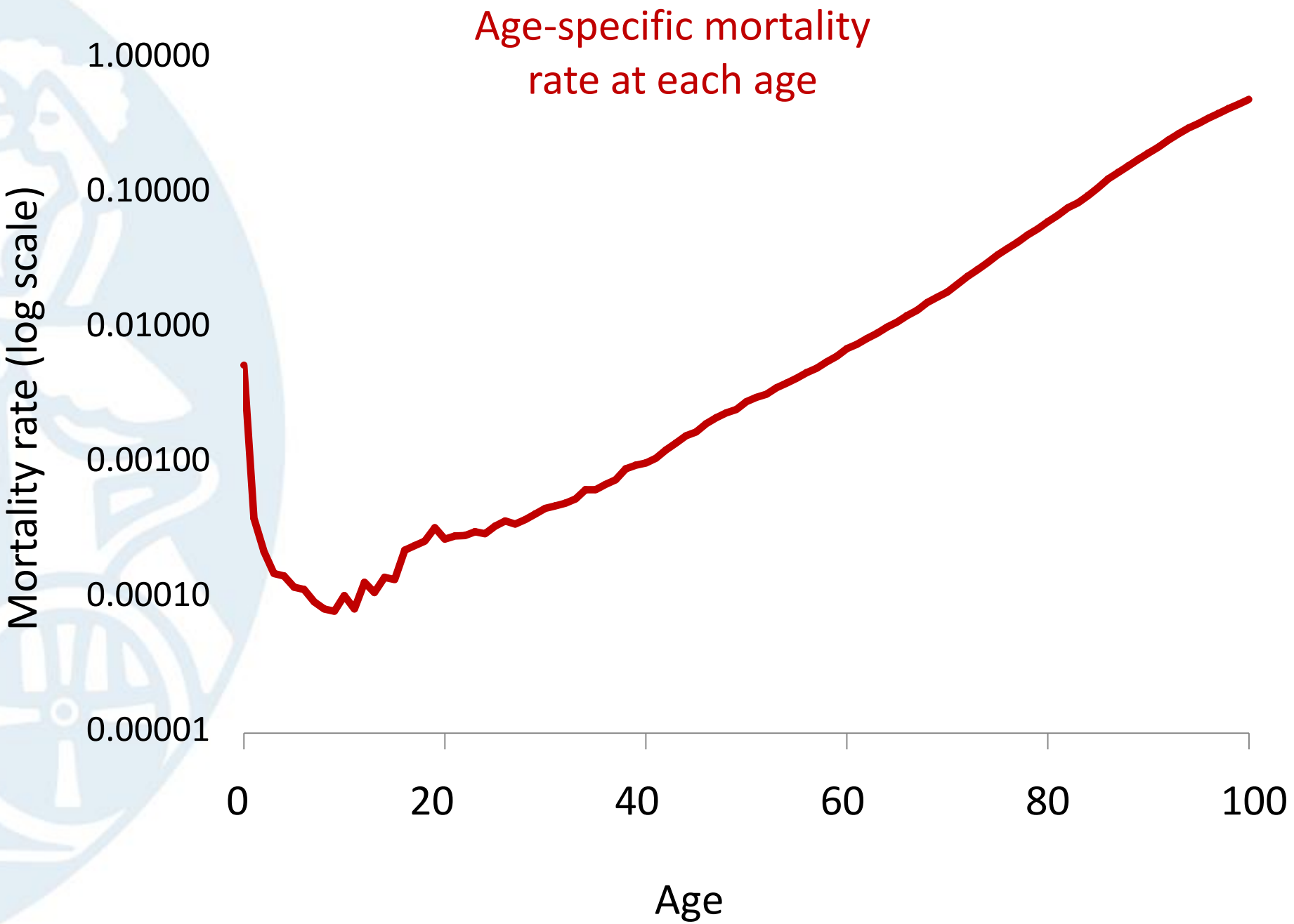
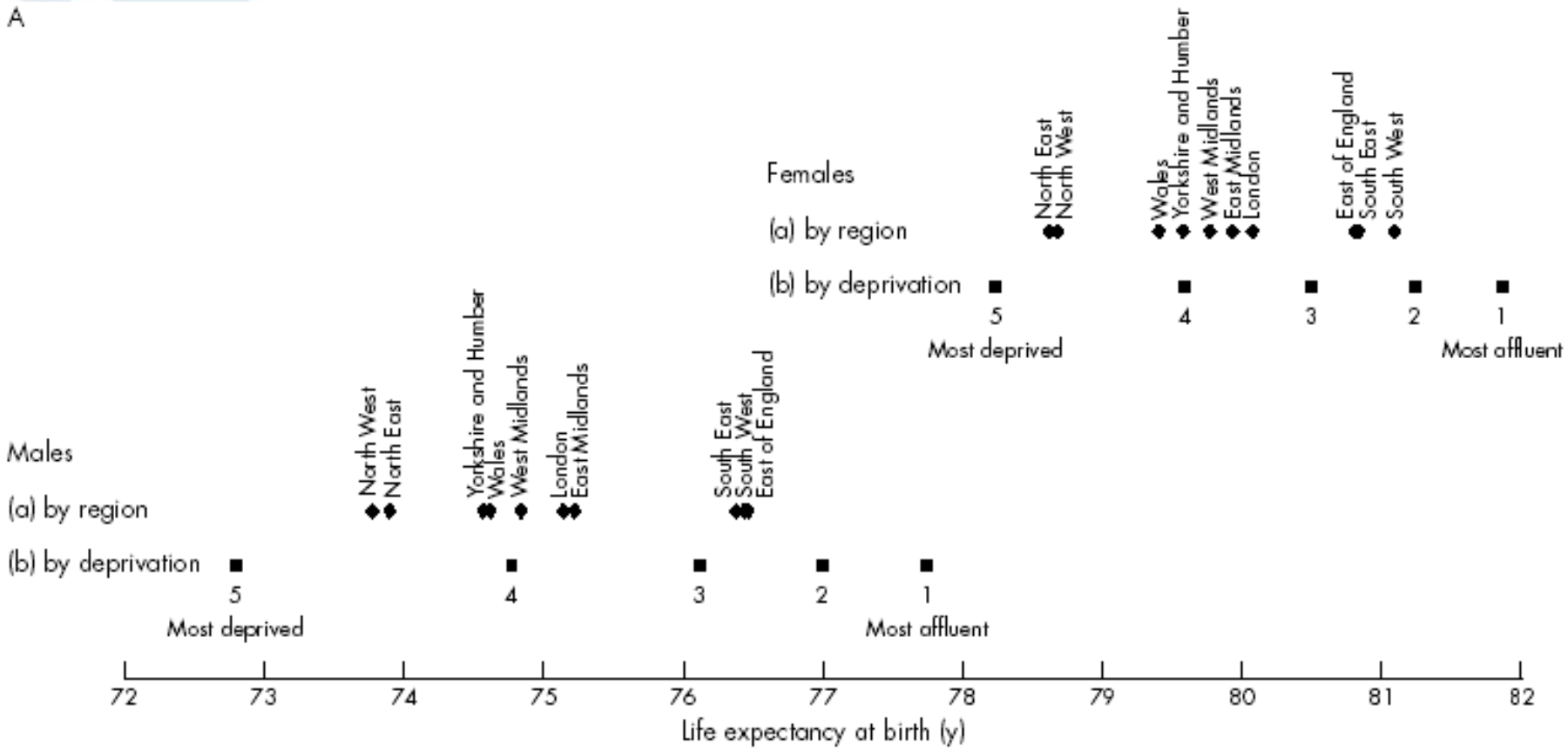
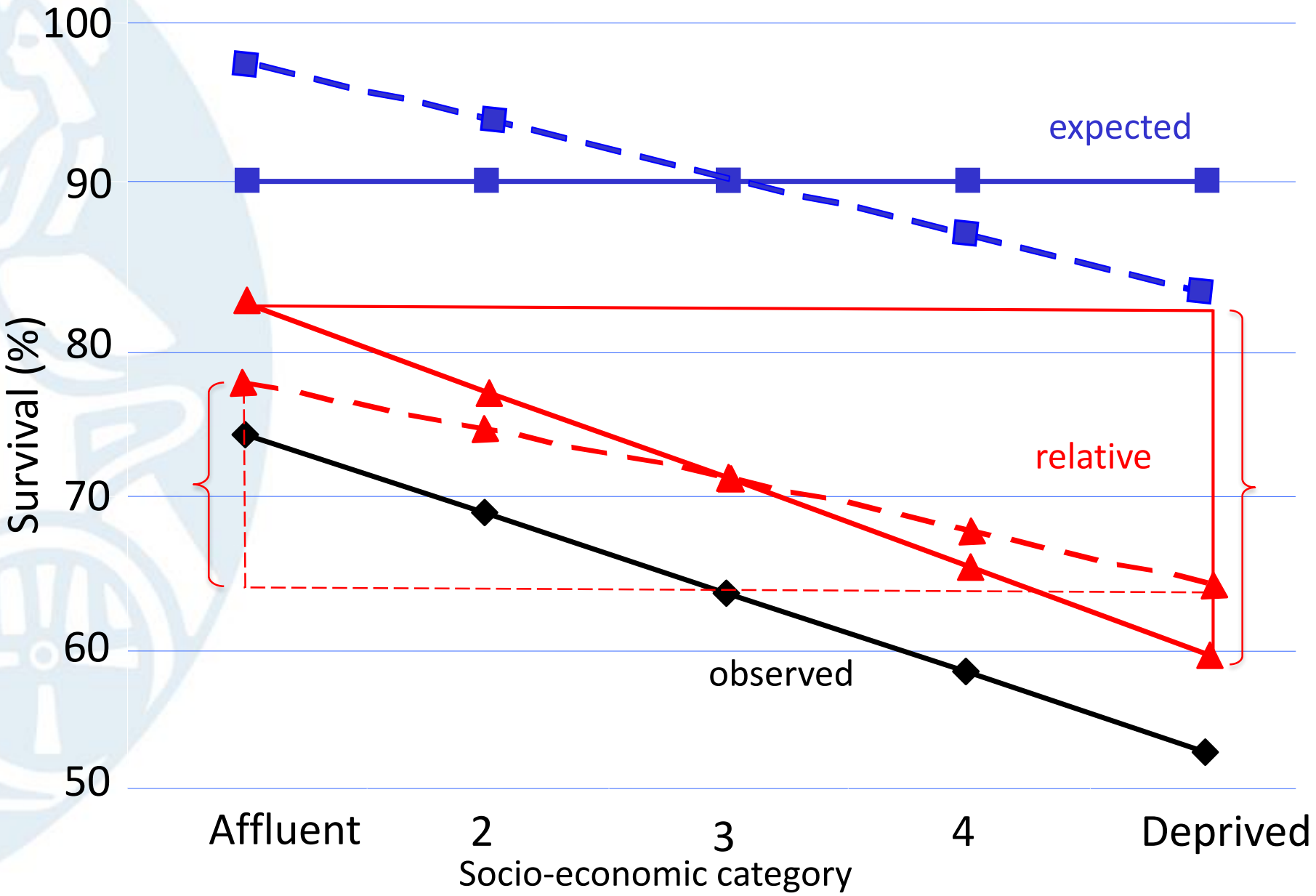

Age-specific mortality rate at each age
Mortality rate (log scale)
1.00000
0.10000
0.01000
0.00100
0.00010
0.00001
0
20
40
60
80
100
Age

Mortality varies by various sub-populations
– life tables can be stratified



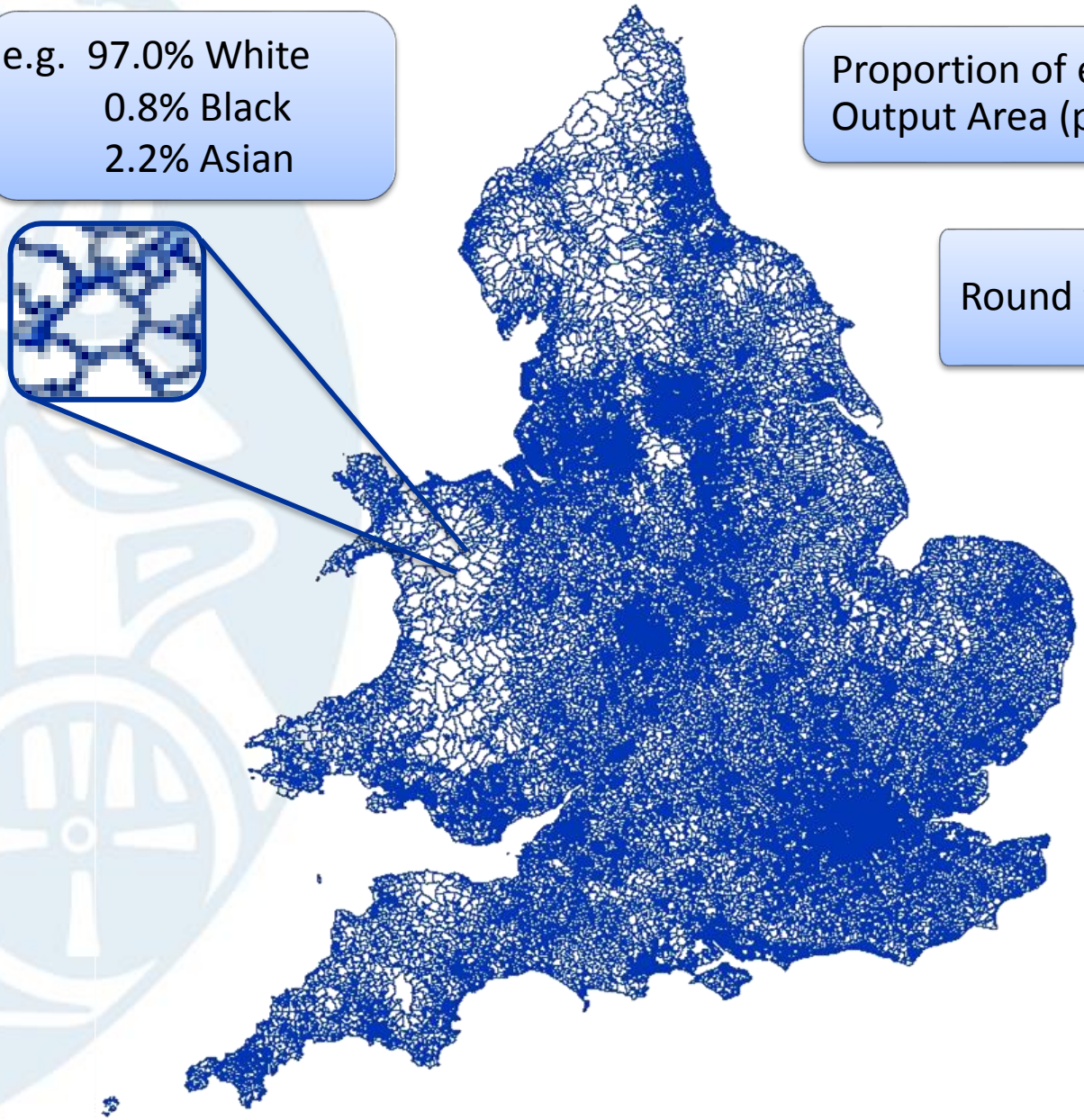
Woods LM, et al (2005) J Epidemiology Community Health

Inequalities in survival – the importance of background mortality



Measures of ethnicity are necessarily ecological

e.g. 97.0% White
0.8% Black
2.2% Asian



Proportion of each ethnicity in each Output Area (population ~350)

Round to nearest 1%

Maximum proportions:
White 100%
Asian 98%
Black 73%

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sex	age	regional code	deaths
1	65	AAFQ 08	1
1	65	AAFQ 14	1
1	65	ABFY 24	3
1	65	ABFZ 01	1
1	65	ABFZ 27	1
1	65	ABFZ 29	2
1	65	ABGA 04	2
1	65	ABGA 19	1
1	65	ABGA 28	1
1	65	ABGB 21	1
1	65	ABGC 04	3
1	65	ABGC 16	1
1	65	ABGC 30	2
1	65	ABGD 06	1
1	65	ABGD 12	2
1	65	ABGE 02	1
1	65	ABGF 24	1
1	65	ABGF 25	1
1	65	ABGG 16	2
1	65	ABGH 06	3
1	65	ABGH 09	4
1	65	ABGH 22	3
1	65	ABGJ 21	1
1	65	ABGJ 23	1
1	65	ABGK 05	2
1	65	ABGK 15	1
1	65	ABGL 17	1
1	65	ABGL 23	1
1	65	ABGP 11	1
1	65	ABGP 19	1
1	65	ACFX 02	3
1	65	ACFX 03	2
1	65	ACFX 15	3
1	65	ACFX 18	2
1	65	ACFY 25	1
1	65	ACFY 27	1
1	65	ACFY 47	1
1	65	ACFZ 01	1
1	65	ACFZ 13	4
1	65	ACFZ 36	4
1	65	ACFZ 50	2
1	65	ACFZ 51	4
1	65	ACFZ 53	1
1	65	ACGA 33	1
1	65	ACGE 15	1
		Total deaths age 65	78

sex	age	regional code	% Asian	deaths
1	65	AAFQ 08	40	1
1	65	AAFQ 14	20	1
1	65	ABFY 24	40	3
1	65	ABFZ 01	50	1
1	65	ABFZ 27	20	1
1	65	ABFZ 29	20	2
1	65	ABGA 04	30	2
1	65	ABGA 19	30	1
1	65	ABGA 28	20	1
1	65	ABGB 21	10	1
1	65	ABGC 04	50	3
1	65	ABGC 16	50	1
1	65	ABGC 30	20	2
1	65	ABGD 06	20	1
1	65	ABGD 12	50	2
1	65	ABGE 02	10	1
1	65	ABGF 24	10	1
1	65	ABGF 25	40	1
1	65	ABGG 16	40	2
1	65	ABGH 06	10	3
1	65	ABGH 09	30	4
1	65	ABGH 22	20	3
1	65	ABGJ 21	10	1
1	65	ABGJ 23	10	1
1	65	ABGK 05	40	2
1	65	ABGK 15	20	1
1	65	ABGL 17	20	1
1	65	ABGL 23	40	1
1	65	ABGP 11	50	1
1	65	ABGP 19	30	1
1	65	ACFX 02	50	3
1	65	ACFX 03	10	2
1	65	ACFX 15	40	3
1	65	ACFX 18	30	2
1	65	ACFY 25	40	1
1	65	ACFY 27	50	1
1	65	ACFY 47	30	1
1	65	ACFZ 01	10	1
1	65	ACFZ 13	50	4
1	65	ACFZ 36	50	4
1	65	ACFZ 50	30	2
1	65	ACFZ 51	40	4
1	65	ACFZ 53	30	1
1	65	ACGA 33	30	1
1	65	ACGE 15	10	1

78

sex	age	regional code	% Asian	deaths	total deaths
1	65	ABGB 21	10	1	
1	65	ABGE 02	10	1	
1	65	ABGF 24	10	1	
1	65	ABGH 06	10	3	
1	65	ABGJ 21	10	1	
1	65	ABGJ 23	10	1	
1	65	ACFX 03	10	2	
1	65	ACFZ 01	10	1	
1	65	ACGE 15	10	1	12
1	65	AAFQ 14	20	1	
1	65	ABFZ 27	20	1	
1	65	ABFZ 29	20	2	
1	65	ABGA 28	20	1	
1	65	ABGC 30	20	2	
1	65	ABGD 06	20	1	
1	65	ABGH 22	20	3	
1	65	ABGK 15	20	1	
1	65	ABGL 17	20	1	13
1	65	ABGA 04	30	2	
1	65	ABGA 19	30	1	
1	65	ABGH 09	30	4	
1	65	ABGP 19	30	1	
1	65	ACFX 18	30	2	
1	65	ACFY 47	30	1	
1	65	ACFZ 50	30	2	
1	65	ACFZ 53	30	1	
1	65	ACGA 33	30	1	15
1	65	AAFQ 08	40	1	
1	65	ABFY 24	40	3	
1	65	ABGF 25	40	1	
1	65	ABGG 16	40	2	
1	65	ABGK 05	40	2	
1	65	ABGL 23	40	1	
1	65	ACFX 15	40	3	
1	65	ACFY 25	40	1	
1	65	ACFZ 51	40	4	18
1	65	ABFZ 01	50	1	
1	65	ABGC 04	50	3	
1	65	ABGC 16	50	1	
1	65	ABGD 12	50	2	
1	65	ABGP 11	50	1	
1	65	ACFX 02	50	3	
1	65	ACFY 27	50	1	
1	65	ACFZ 13	50	4	
1	65	ACFZ 36	50	4	20

78

Constructing the life tables

Merge mortality data with population data from census

Collapse data: deaths grouped by age and proportion of ethnic group

Predict the mortality for each age and proportion of each ethnic group, adjusted for deprivation

Create life table for each ethnicity based on maximum proportion in any OA

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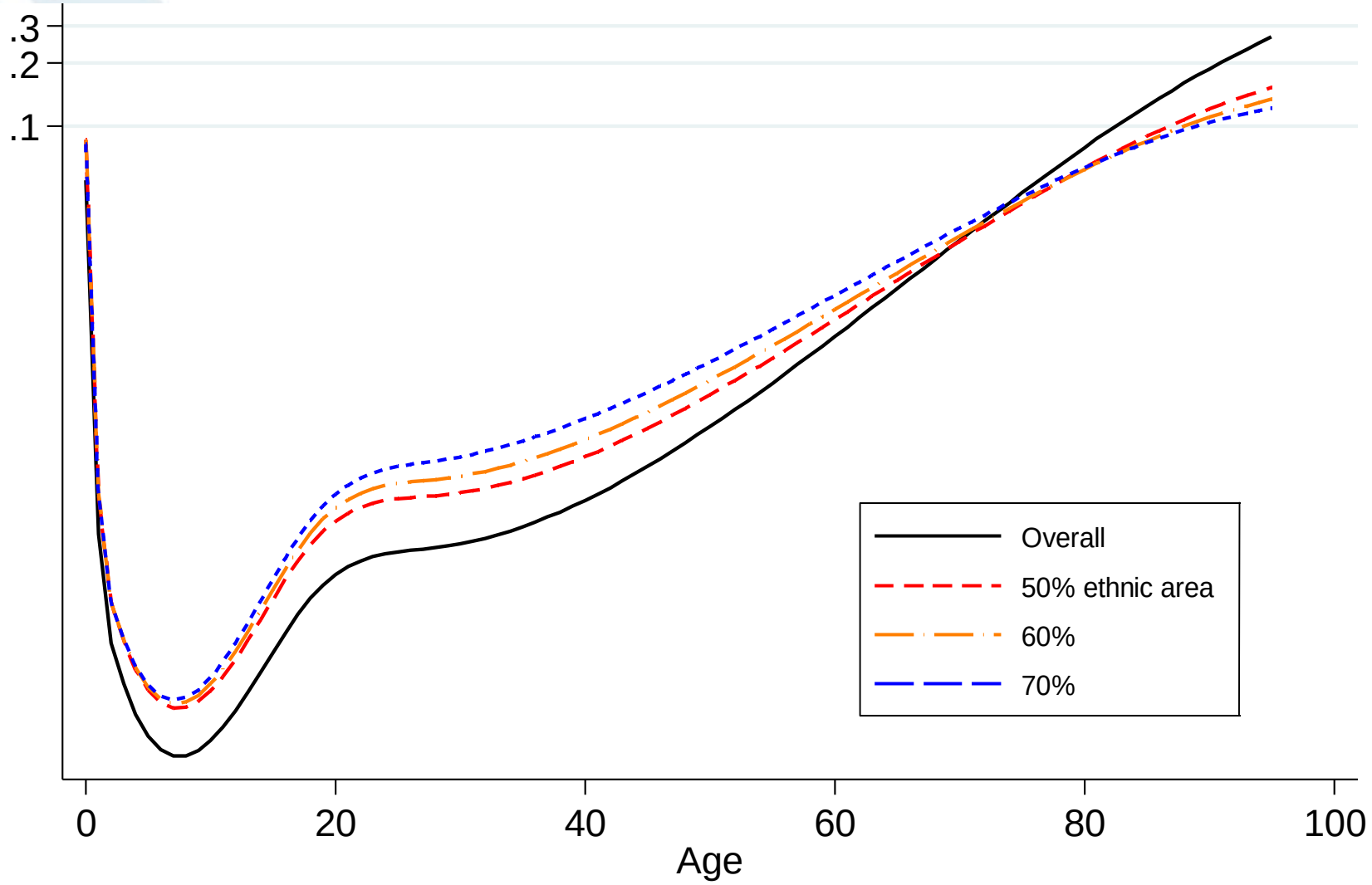
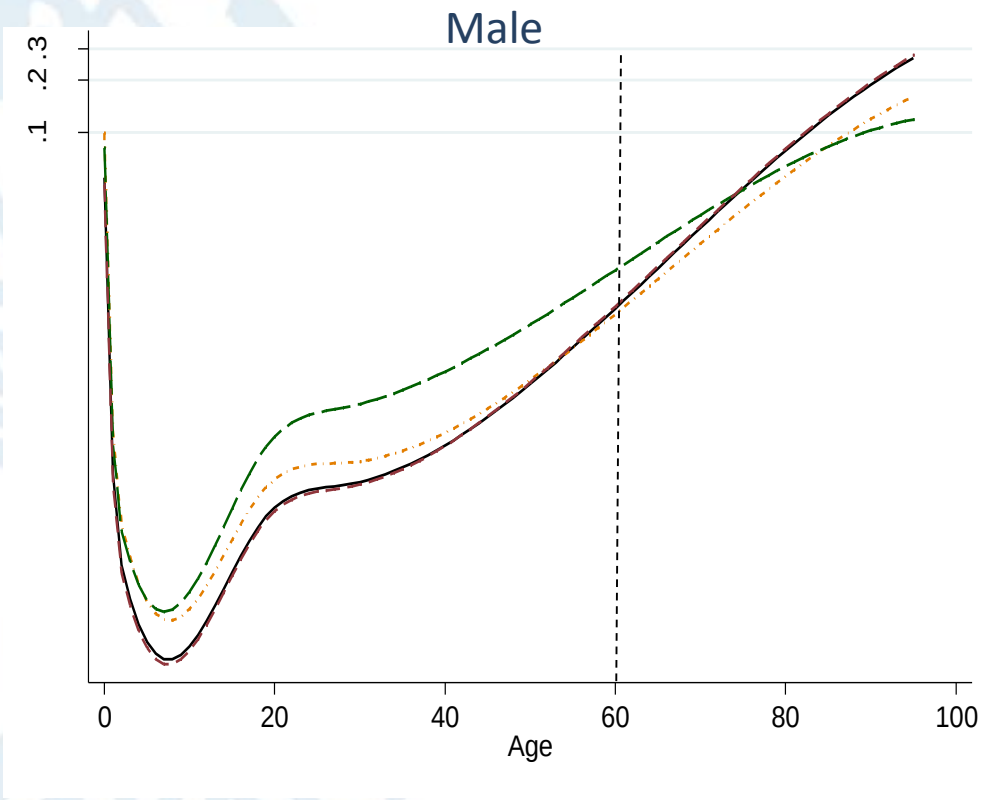
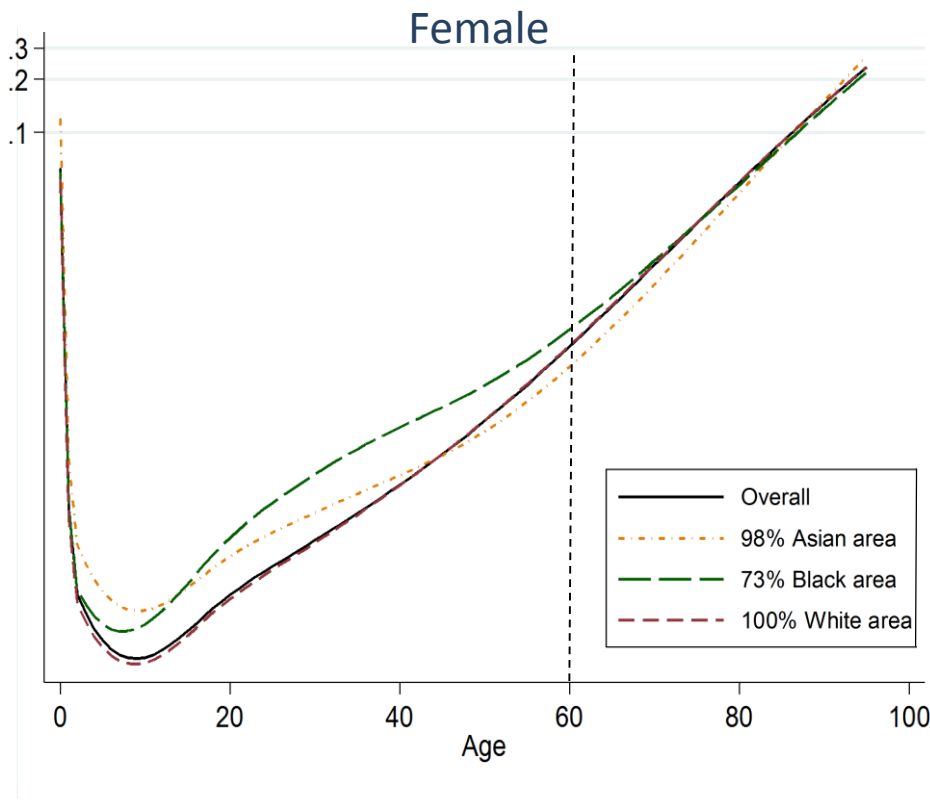
The results: mortality rates by deciles of ethnic proportion in Black males, adjusted for deprivation



The results: mortality rates by ethnicity, adjusted for deprivation

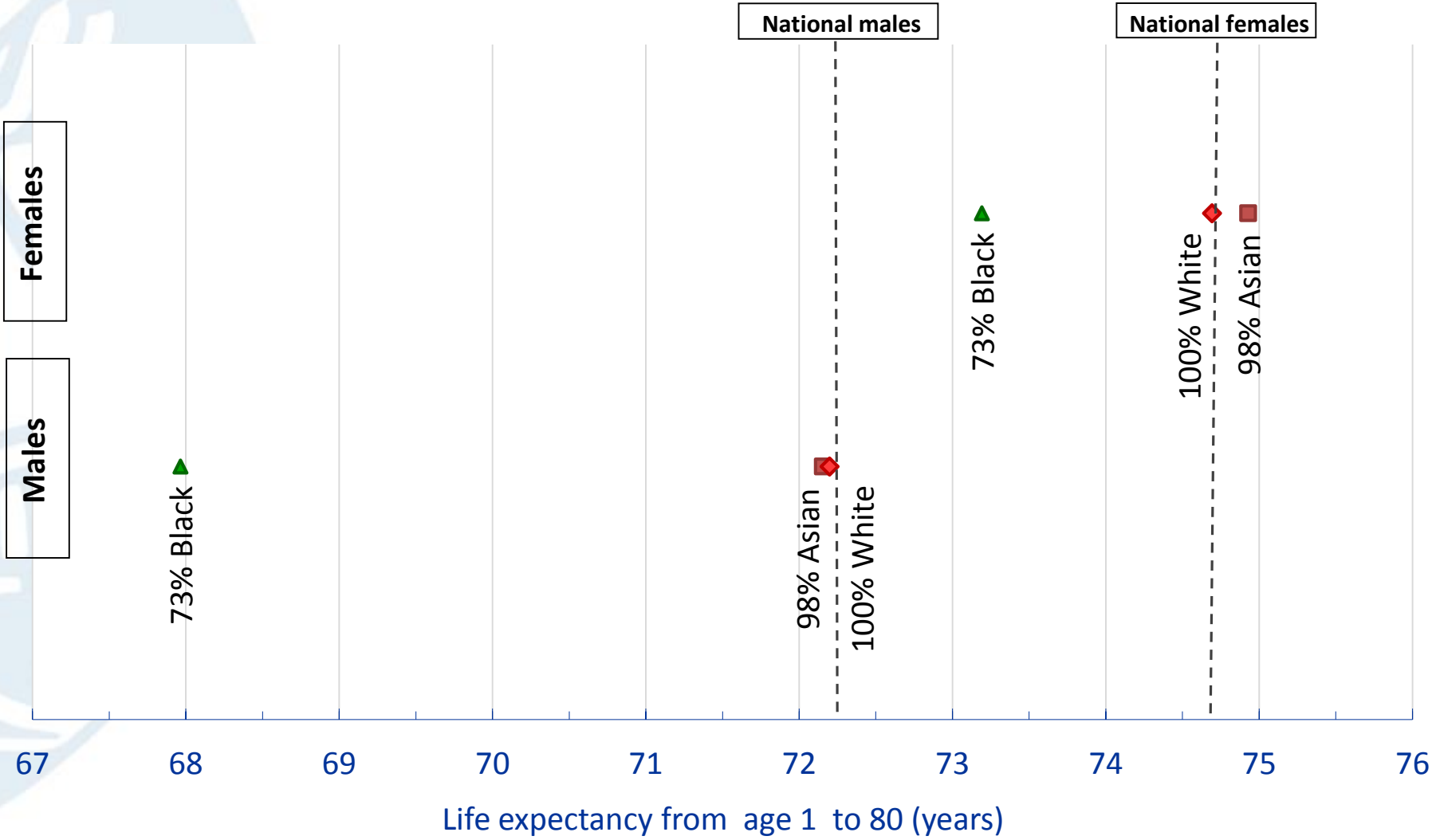




Mortality rate per 1000 pyrs	Asian	Black	White
Men	9.1	16.3	10.1
Women	4.7	10·3	6.1

The results: Life expectancy by ethnicity (from 1 to 80 years)

Life expectancy from age 1 to 80, by majority ethnic group, adjusted for deprivation



Conclusions

- Novel ecological method of constructing ethnic majority life tables
- Shows differences in mortality experiences for the main ethnic groups beyond the impact of deprivation
- Diversity remains within these three broad ethnic groups
- Watch out for the ecological fallacy!
- Use to inform public health planning and in survival analysis for breast cancer project

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melanie.morris@lshtm.ac.uk

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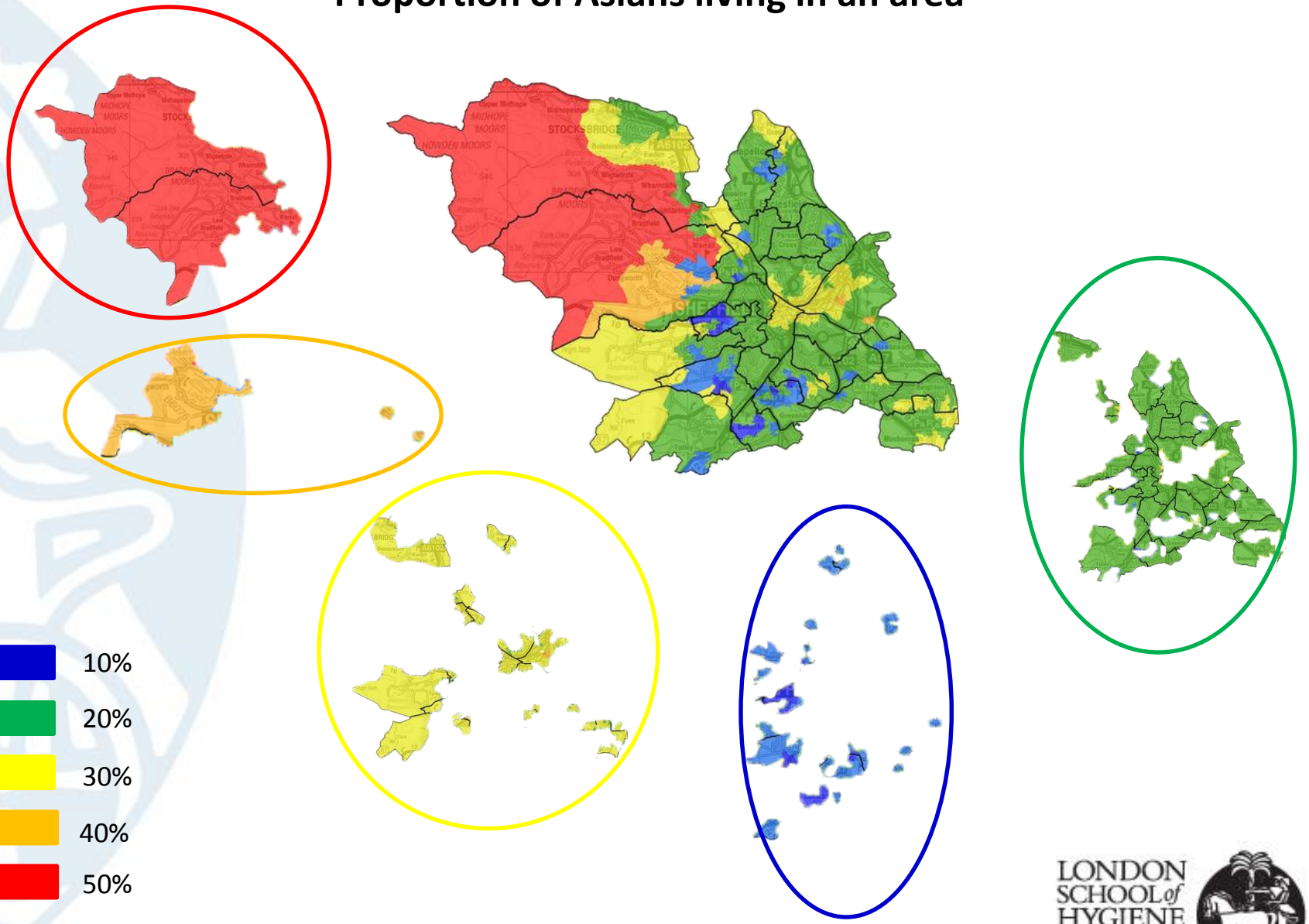
Proportion of Asians living in an area



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