OXFORD POPULATION HEALTH

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Education and cancer incidence and mortality

a prospective study of 0.5 million Chinese adults in the China Kadoorie Biobank

Marwa Elbasheer
3rd year PhD Candidate
Marwa.Elbasheer@ndph.ox.ac.uk

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“Cancer, a disease of difference”[1]

Cancer is a leading cause of mortality globally, with an estimated 20 million newly diagnosed cases and approximately 10 million cancer-related deaths in 2022[2].

Socioeconomic inequalities in cancer are well established within and between countries and remain a public health concern.

However,

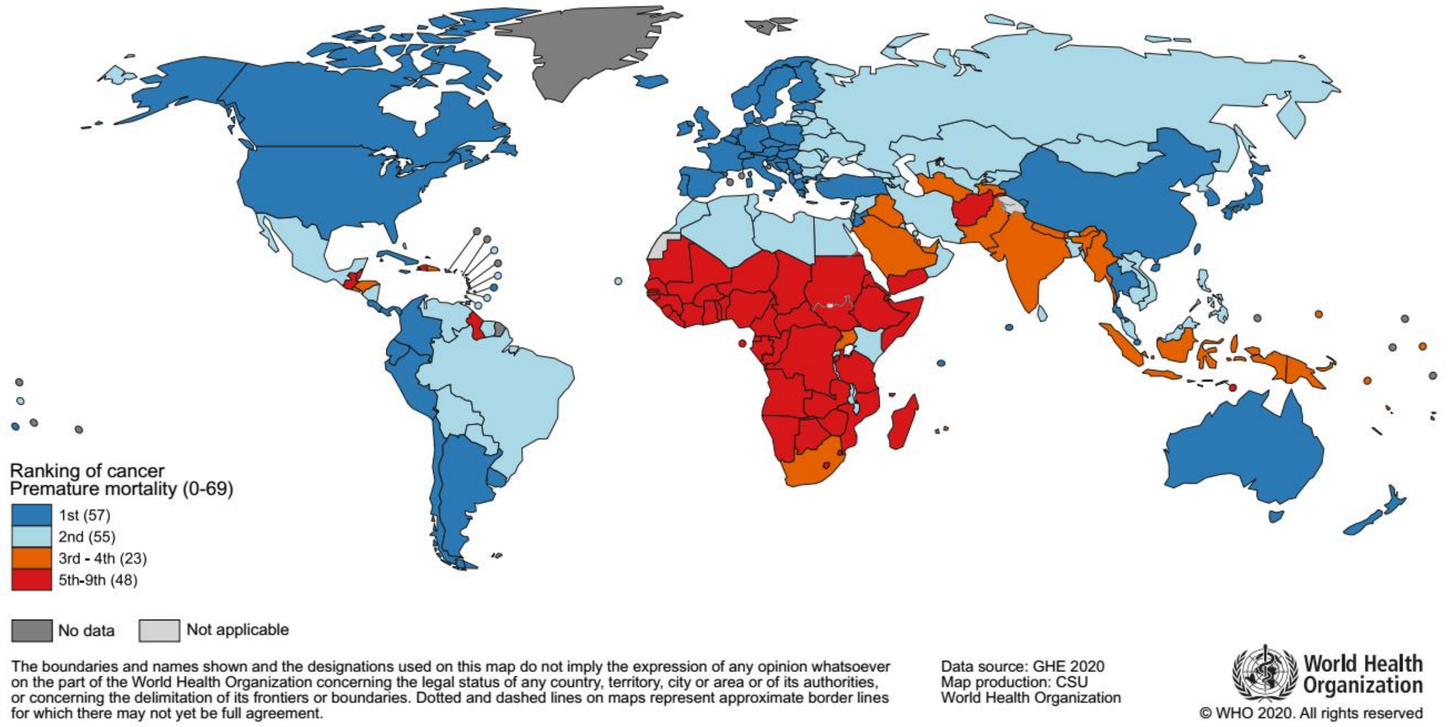
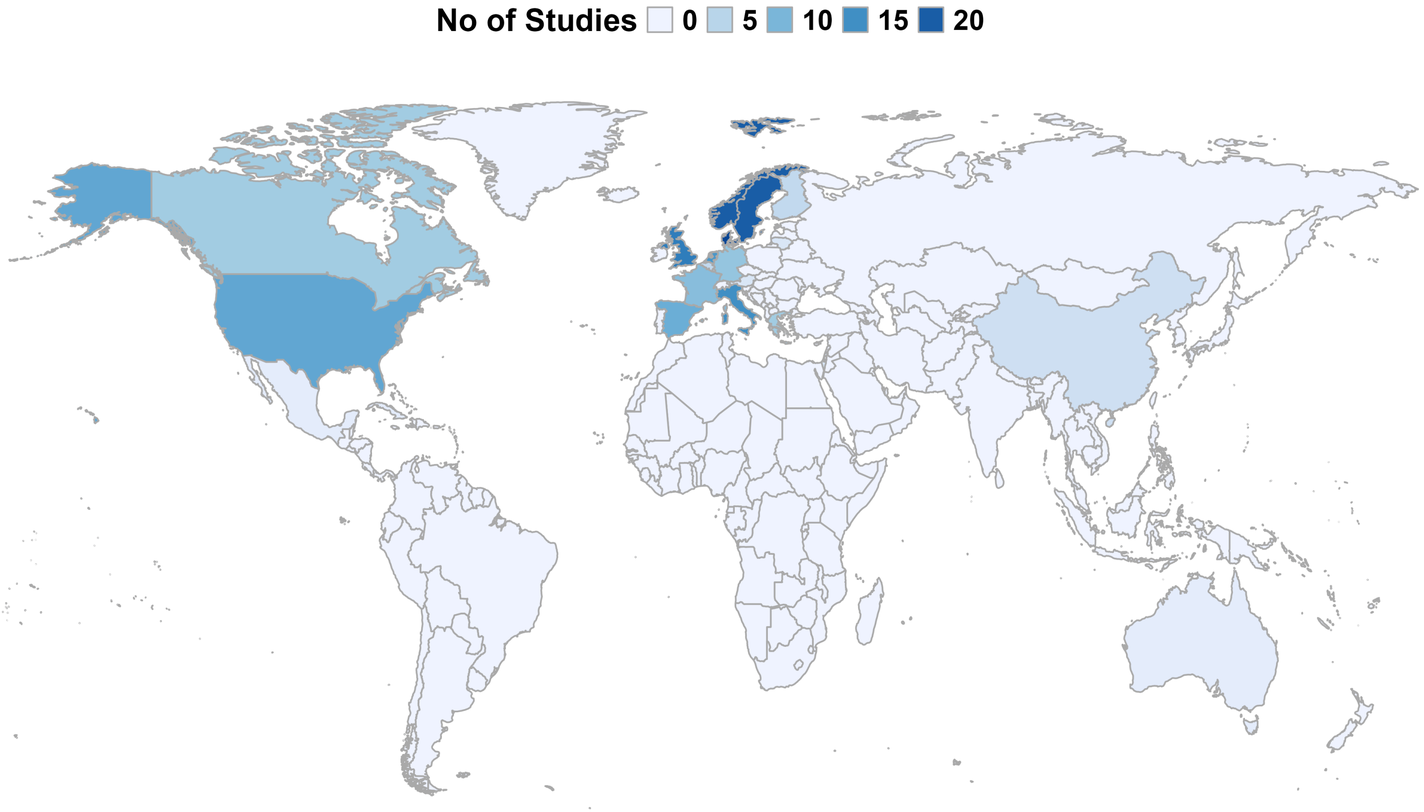


FIGURE 1. National Ranking of Cancer as a Cause of Death at Ages <70 Years in 2019. The numbers of countries represented in each ranking group are included in the legend. Source: World Health Organization.

Uncertainties characterise the relationship between individual-level socioeconomic measures and cancer risk, with the association being dynamic and evolving in response to countries’ economic development and changes in social and lifestyle behaviours; understanding the contemporary relationship may help inform countries’ health policy

1. Reducing Social Inequalities in cancer: evidence and priorities for research. International Agency for Research on Cancer, 2019
2. Bray F, Laversanne M, Sung H, et al. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2024; 74(3): 229-263

Geographical distribution of 114 prospective studies on the association of socioeconomic status with cancer incidence and mortality (1990-2024)



	Cohort study (n=50)	Record linkage (n=64)
Australia	1	0
Eastern Asia	6	3
Western Asia	0	2
Central America	1	0
Caribbean	1	0
North America	10	9
Northern Europe	15	32
Southern Europe	2	9
Western Europe	8	7
Multiple European Countries	6	2

94 studies (82.5%) assessed **education** as a proxy of socioeconomic status

Two studies from **China** only explored the association with gastrointestinal cancers

China Kadoorie Biobank: Cohort profile

○ **Rural** ● **Urban**

Demographic characteristics of CKB participants' by geographical region

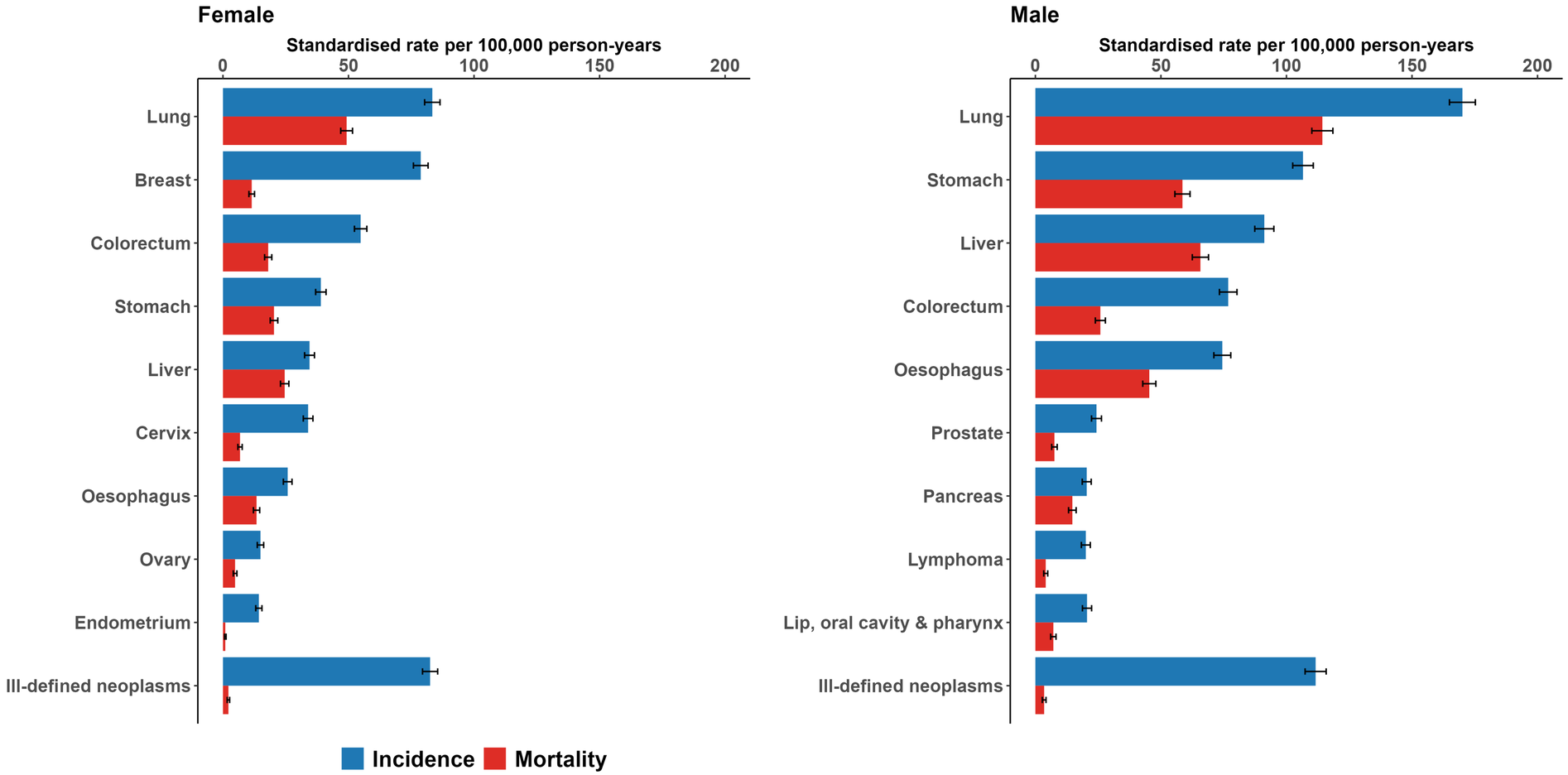
Region	Female		Male	
	Age (IQR)	n	Age (IQR)	n
Rural				
Sichuan	50.7 (16.2)	34,039	53.1 (18.0)	21,052
Gansu	46.7 (16.0)	30,393	51.2 (17.5)	19,115
Henan	49.6 (15.1)	35,057	50.9 (17.2)	27,452
Zhejiang	51.9 (15.0)	33,450	52.9 (15.9)	23,792
Hunan	50.1 (15.9)	33,132	53.3 (17.9)	26,132
Total	50.0 (15.8)	166,071	52.3 (17.4)	117,543
Urban				
Qingdao	50.4 (15.6)	19,499	48.8 (13.3)	15,388
Harbin	52.0 (18.0)	33,734	52.4 (20.1)	22,878
Haikou	51.6 (18.9)	18,726	54.0 (20.2)	10,692
Suzhou	51.5 (16.2)	30,566	52.3 (16.7)	22,046
Liuzhou	53.1 (15.0)	30,461	55.0 (17.6)	19,114
Total	51.9 (16.7)	132,986	52.3 (17.8)	90,188

512,724 Chinese adults from 10 regions (5 urban, 5 rural); 59% female, median age 51 years

Baseline characteristics of CKB participants

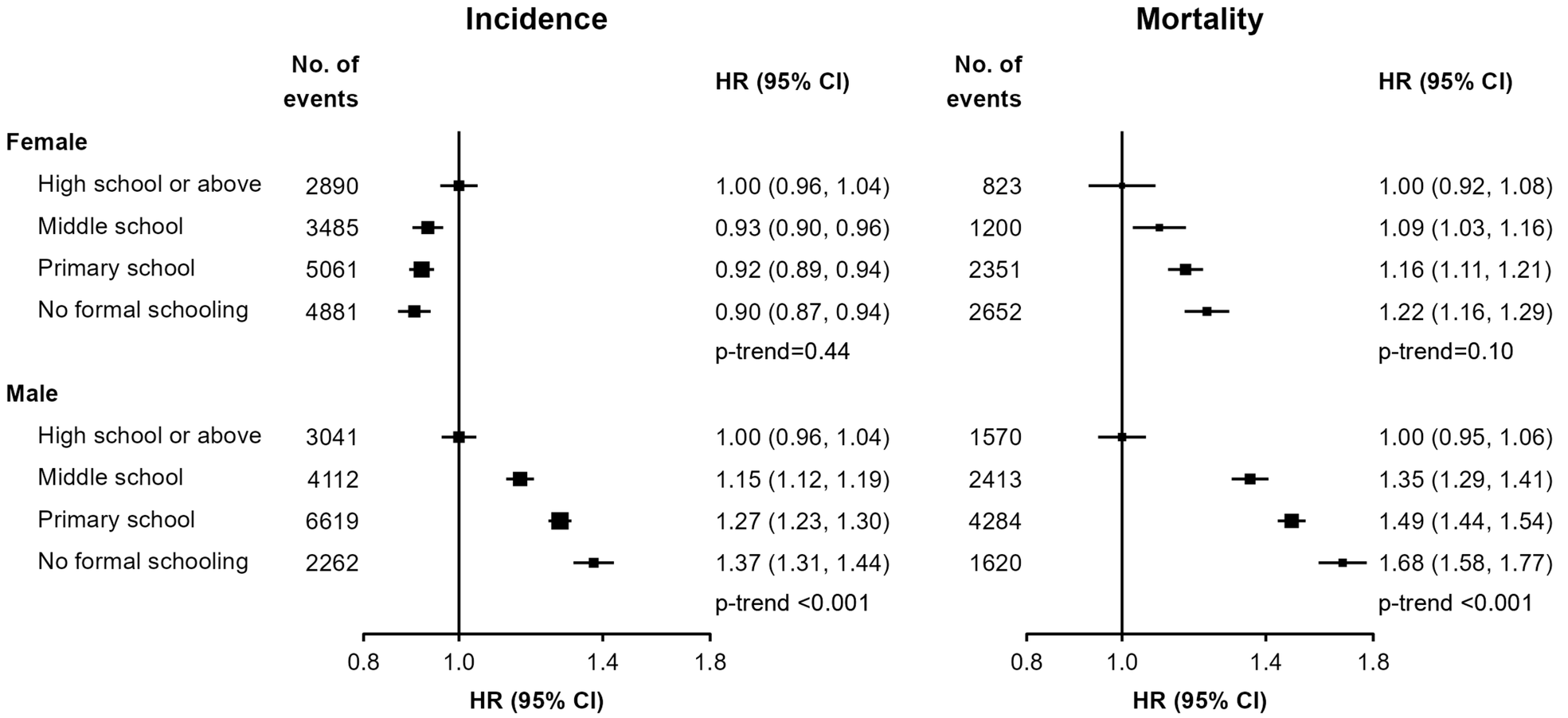
	Female (n=299,057)	Male (n=207,661)
Age, years - median(IQR)	50.9 (16.1)	52.3 (17.5)
Socioeconomic characteristics		
High school or above, %	17.9	25.3
≥35,000 yuan, %	16.5	20.3
Professional/technical, %	2.6	3.7
Has all assets, %	20.6	21.9
Lifestyle factors		
BMI, kg/m² - mean(SD)	23.8 (3.4)	23.4 (3.2)
Physical activity (MET/hrs/day) – median (IQR), Rural	19.7 (19.7)	21.5 (24.2)
Physical activity (MET/hrs/day) - median(IQR), Urban	14.5 (14.3)	16.0 (21.3)
Regular smoker, %	2.3	61.2
Regular alcohol drinker, weekly, %	2.1	33.3
Health and medical history		
Any chronic disease, %	15.5	14.5
Poor self-rated health, %	11.2	8.7
Family history of cancer, %	16.3	16.5
Health care cover, %	80.2	85.0

Most common cancer sites incidence and mortality by sex



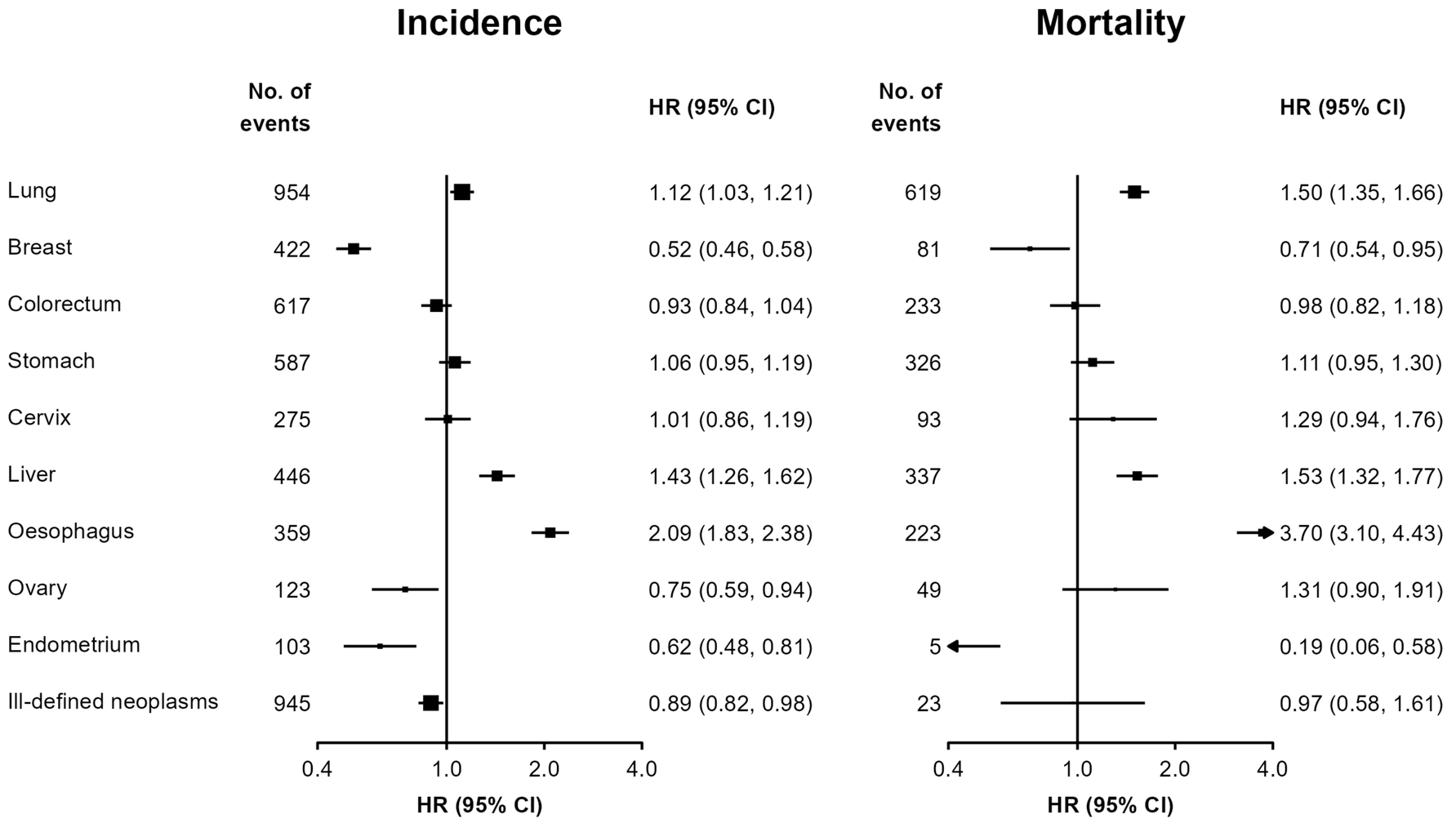
Rates were standardised to the baseline age distribution of the study population and the study areas

Educational level and risk of overall cancer



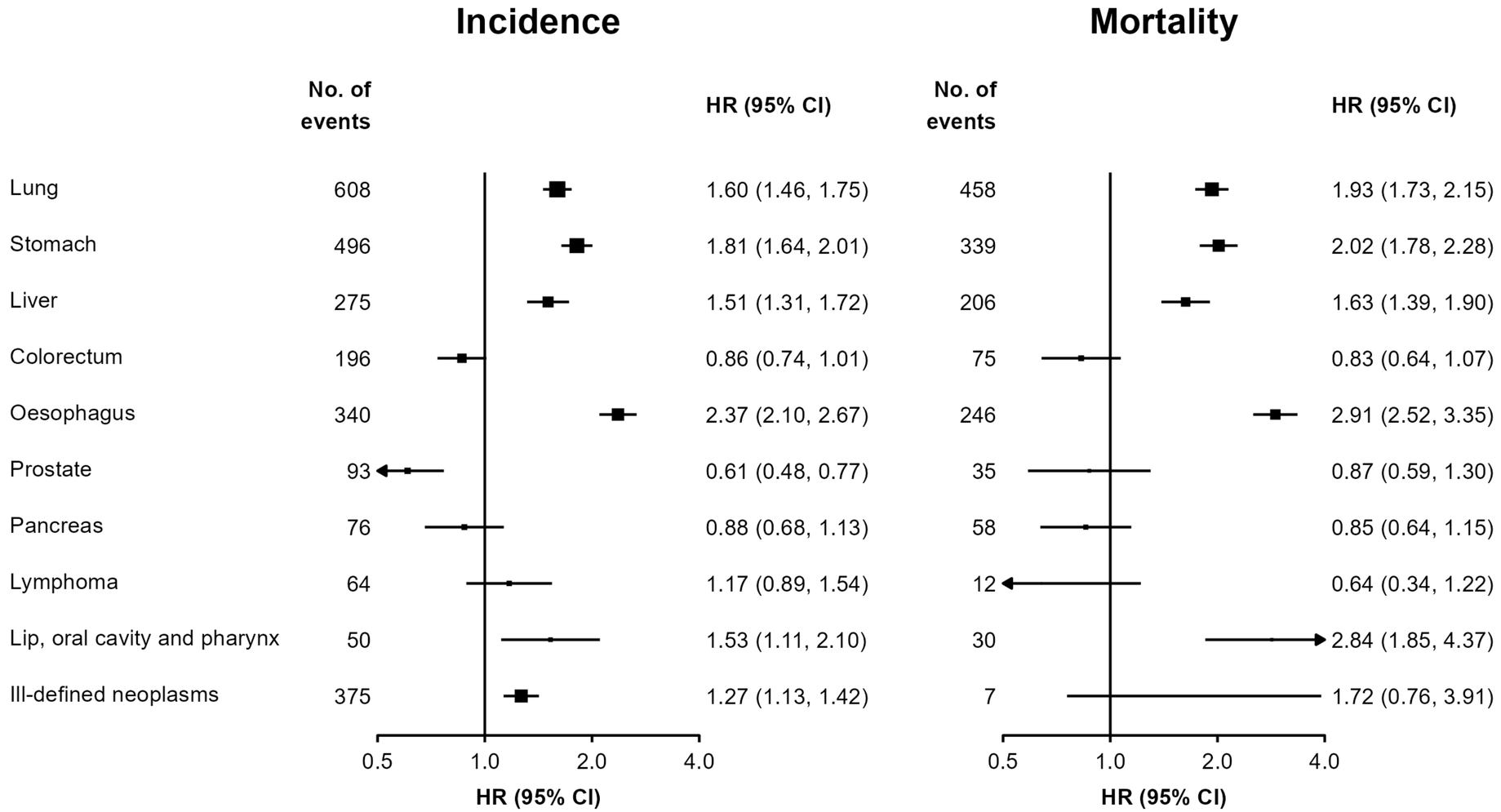
Models were adjusted for age and stratified by region

FEMALES: Educational level (none vs high) and risk of most common cancers



Models were adjusted for age and stratified by region

MALES: Educational level (none vs high) and risk of most common cancers



Models were adjusted for age and stratified by region

Conclusion

- This may be the largest prospective study to date that assessed the association of education with the risk of overall and site-specific cancer in China.

- Strong evidence of educational inequalities in the risk of overall, smoking-related (particularly among males), and hormonally-influenced cancers (particularly among females) among Chinese middle-aged adults.

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China Kadoorie Biobank Participants

China Kadoorie Biobank Team