

# Does age affect diagnostic intervals in cancer? UK database study

Richard Neal,<sup>1</sup> Nafees Ud Din,<sup>1</sup> William Hamilton,<sup>2</sup> Ben Carter,<sup>1</sup> Obi Ukoumunne,<sup>2</sup> Sal Stapley,<sup>2</sup> Greg Rubin<sup>3</sup>

1-North Wales Centre for Primary Care Research, Bangor University 2-Peninsula College of Medicine and Dentistry, University of Exeter  
3-School of Medicine and Health, Durham University

## Background

Several papers have reported age as a factor in cancer diagnostic delays. However the extent to which diagnostic intervals (the times from first presentation to diagnosis) vary with age is unknown.

If there is variation, this is potentially modifiable and will have implications for survival.

## Aims

To assess the effect of age on diagnostic intervals in patients diagnosed with one of eight cancers (breast, lung, colorectal, gastric, oesophageal, pancreatic, bladder, and endometrial)

## Methods

We analysed data from the UK General Practice Research Database 2007-2010.

- The dataset had 500+ patients aged >40 years for each cancer.

- Potential cancer symptoms were predetermined for each cancer, and the database searched to find the first presentation of one of these in the year preceding diagnosis, and the diagnostic interval calculated.

- Initial presenting symptoms were classified into whether they fulfilled the criteria for urgent referral or investigation (NICE guidelines 2005).

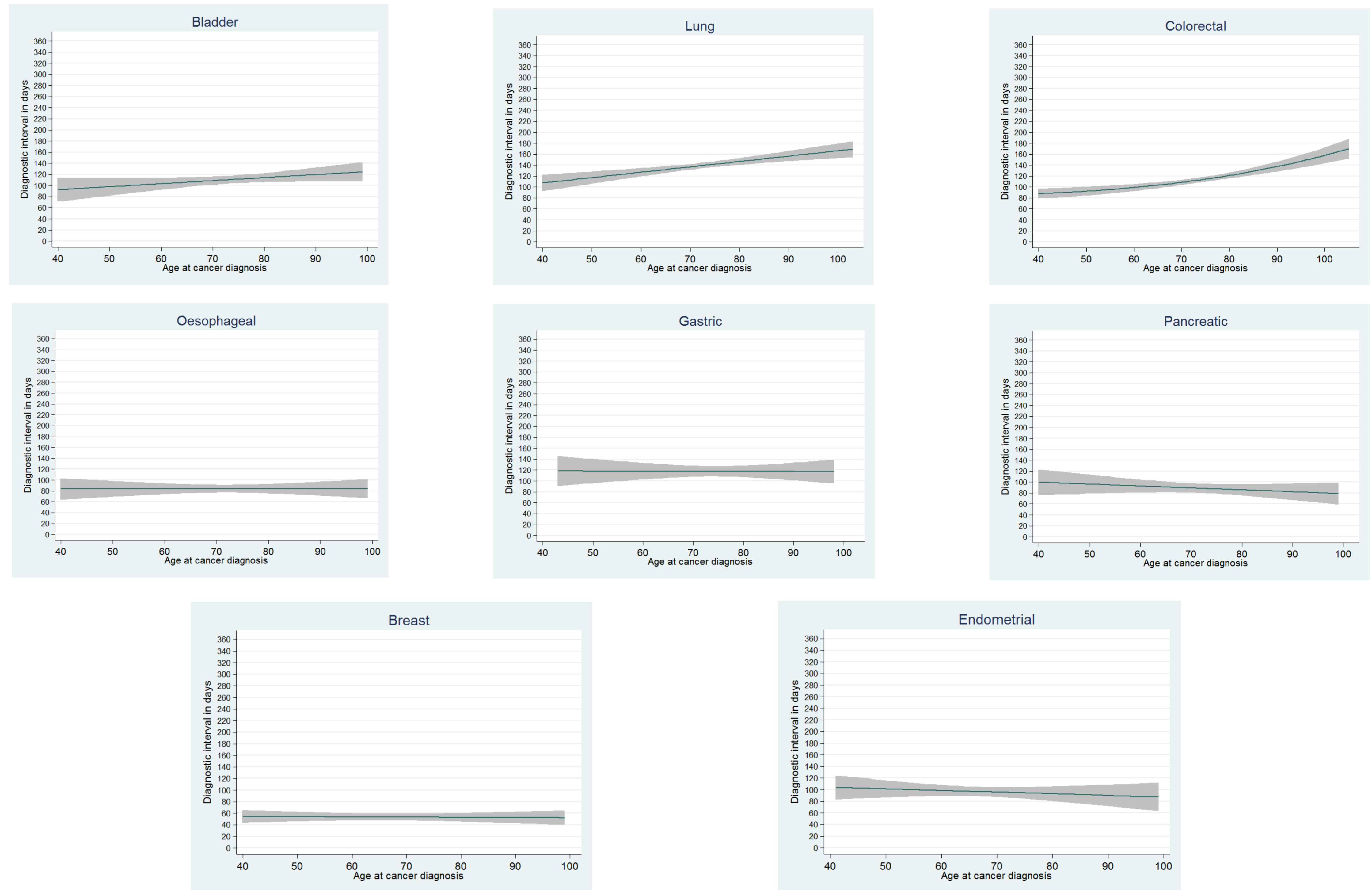
- We plotted diagnostic interval versus age at diagnosis for each cancer.

- Where these were linear, logistic regression was undertaken to demonstrate the incremental diagnostic interval change per 10 years of age.

- Where these were non-linear, we categorised the patients into five equal categories and undertook a test of interaction to show the relationship of age with diagnostic intervals using the youngest age category as the reference.

## Results

The fitted lines (based on fractional polynomial models) were linear for all cancers except colorectal.



Logistic regression of the relationship of age with diagnostic intervals (DI) for 7 cancers

Cancer type	N	Incremental DI change (in days) per 10 years of age	95% Confidence Interval		P value
			Lower	Upper	
Bladder	939	5.4	-.05	11.4	0.07
Breast	912	-0.4	-3.7	2.9	0.82
Lung	2567	9.8	5.6	14.0	<0.001
Pancreatic	524	-3.5	-10.2	3.2	0.30
Oesophageal	761	0.1	-5.6	5.8	0.97
Gastric	562	-0.2	-8.3	7.8	0.96
Endometrial	511	-2.8	-9.9	4.3	0.43

The incremental increase in diagnostic intervals per 10 years varied from 10 days for lung cancer to -3.5 days for pancreatic cancer.

We categorised the colorectal cancer into five equal age categories and calculated mean DI differences of all categories with reference to the youngest. For this model we adjusted for gender and whether the initial presenting symptom was a 'NICE-qualifying symptom' or not.

Test of interaction of age with diagnostic intervals in colorectal cancer adjusted for gender and NICE category

Age group categories	Regression coefficient (Mean difference)	95% Confidence Interval		P value
		Lower	Upper	
Lowest (40-62)				
Category 2 (63-70)	4.8	-6.8	16.3	0.42
Category 3 (71-76)	12.3	0.8	23.9	0.03
Category 4 (77-81)	20.6	8.5	32.6	0.001
Highest (82+)	36.2	24.8	47.7	<0.001

## Conclusions

Differing age related patterns have been demonstrated of these eight different cancers. For most, there appears to be little difference with age. However, for lung, and especially for colorectal cancer, diagnostic intervals increased with age. There may be many factors that influence this, including:

- Varying symptom patterns with age, although this analysis suggests that this is unlikely to be the cause (at least for colorectal cancer)
- The effect of gender, although this analysis suggests that this is unlikely to be the cause (at least for colorectal cancer)
- Co-morbidity masking potential cancer symptoms
- A reluctance by GPs to refer or investigate older and frailer people
- Varying tumour biology and aggressiveness with age

**Implications:** More work is needed to understand the complex interaction between age and diagnostic intervals, and its effect on stage at diagnosis, especially for lung and colorectal cancers.