

Exploring the ordering and setting of cancer and cardiovascular disease diagnosis by area-level deprivation in Wales.

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Introduction

Cancer and cardiovascular disease (CVD) are two of the largest causes of death in the UK [1]. Individuals with multiple long-term conditions have a higher mortality rate. Emergency department (ED) diagnoses are increasing every year with 1.1 million attendances in Wales in 2024-2025 [2].

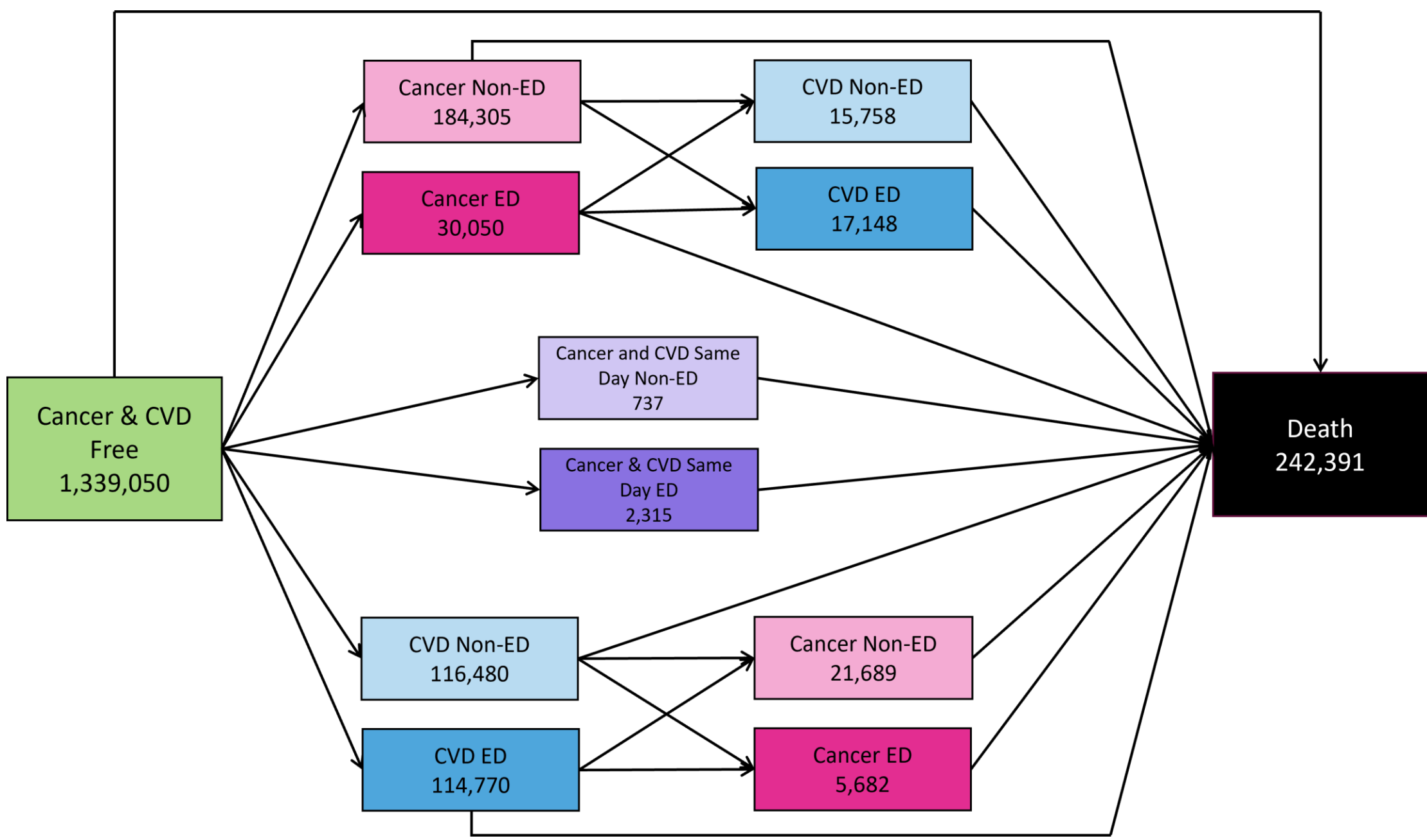
Objectives

This research aims to understand the timing, ordering, and setting of cancer and CVD diagnoses in Wales, and assess the impact of setting of diagnosis (non-ED and ED) and time to death by area-level deprivation.

Methods

Population-scale, linked anonymized electronic health records (EHRs) for all individuals residing in Wales over a 15-year period (2005 – 2019) with a 5-year clearance period (2000 – 2004) from the Wales Multimorbidity e-Cohort (WMC) [3] within the Secure Anonymised Information Linkage (SAIL) Databank were used. 10 diagnostic groups were defined - 5 diagnosis types each split into non-ED or ED diagnoses, as well as a group of disease-free individuals and those who died during the cohort period (Figure 1).

Figure 1: Diagnostic pathway map, including counts of individuals in each diagnostic group.

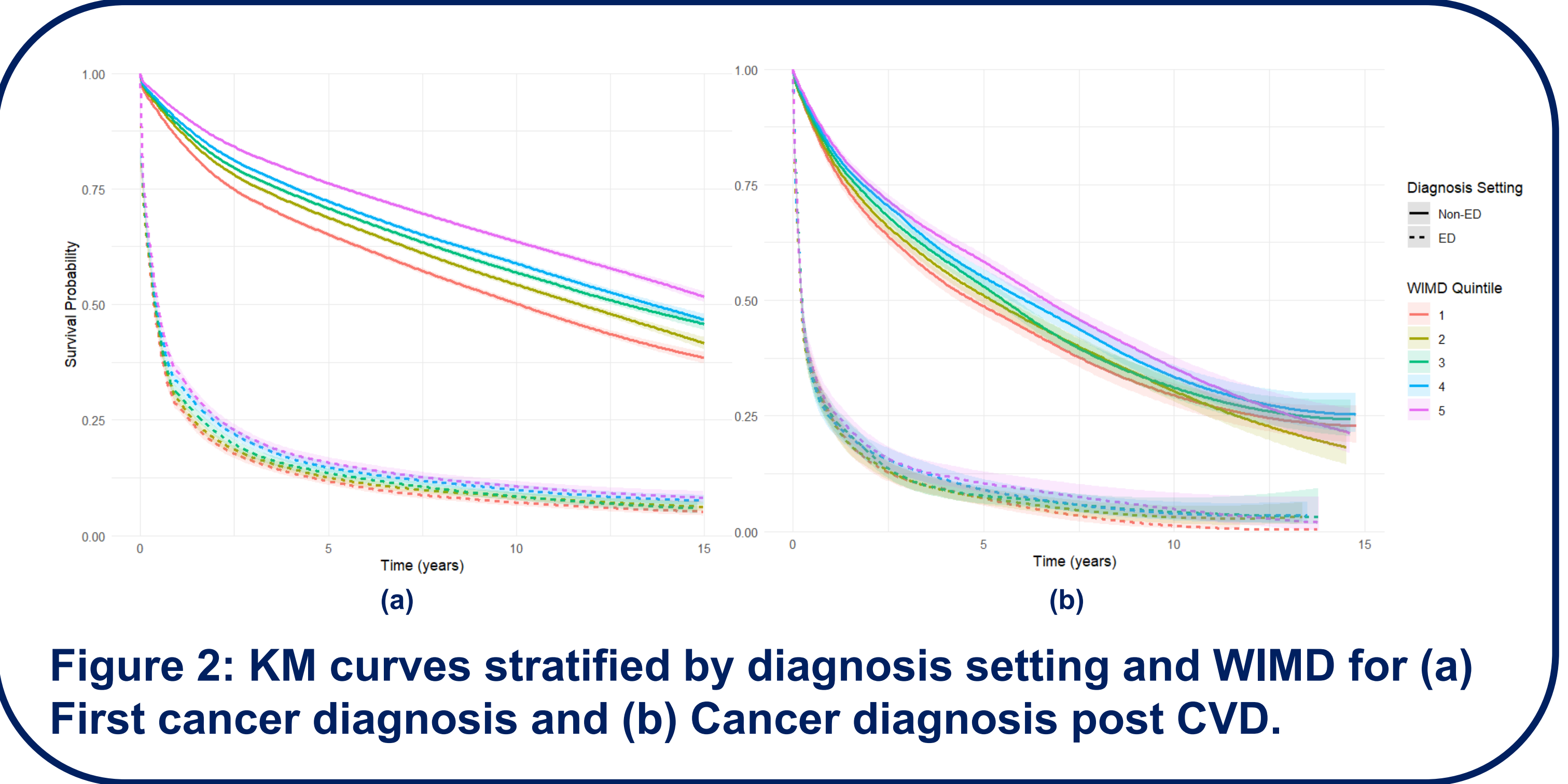


Smoothed Kaplan-Meier (KM) curves, stratified by diagnosis setting and Welsh Index of Multiple Deprivation (WIMD) were used to evaluate the time to death post cancer/CVD diagnosis for all 10 diagnostic groups. Cox proportional hazards (CoxPH) models were used to assess time to death from diagnosis by setting and WIMD, adjusted for age, sex and rurality. Logistic regression models, adjusted for age, sex and rurality, were used to evaluate the odds of diagnoses made in ED settings by WIMD for each diagnostic group.

Results

1,339,050 individuals were included in the cohort. 244,778 (18.3%) individuals received a cancer diagnosis, 267,208 (17.1%) individuals received a CVD diagnosis, and 63,329 (4.7%) received diagnoses of both cancer and CVD (Figure 1).

The median survival time for an individual who receives a cancer diagnosis in a non-ED setting was 10.04 (95% CI: 9.80, 10.27) years for a most deprived individual. For a cancer diagnosis in an ED setting the median survival time was 0.28 (95% CI: 0.26, 0.30) years for most deprived, compared to 0.39 (95% CI: 0.36, 0.42) years for least deprived (Figure 2).



The median survival time for an individual who received a cancer diagnosis post CVD in a non-ED setting was 4.70 (95% CI: 4.36, 5.10) years for most deprived individual and 6.67 (95% CI: 6.21, 7.03) years for least deprived. For an individual diagnosed in an ED setting the median survival time is 0.21 (95% CI: 0.18, 0.26) years for individuals from both most deprived and least deprived areas (Figure 2).

Model and Covariate	HR (95% CI)	Model and Covariate	OR (95% CI)
Cancer diagnosis Setting = ED	6.03 (5.94,6.12)	Cancer diagnosis WIMD = 5	0.56 (0.54,0.59)
Cancer diagnosis WIMD = 5	0.66 (0.65,0.68)	Cancer diagnosis post CVD WIMD = 5	0.59 (0.54,0.65)
Cancer diagnosis post CVD Setting = ED	5.03 (4.85,5.21)		
Cancer diagnosis post CVD WIMD = 5	0.78 (0.74,0.82)		

The adjusted CoxPH models showed a 6-fold increase in the hazard of death for cancer diagnosis in ED settings compared to in non-ED settings, and a 34% decrease in hazard when from a least deprived area compared to most deprived. For an individual diagnosed with cancer post CVD there is a 5-fold increase in hazard of death in an ED setting, and a decrease of 22% in hazard for an individual from an area of least deprivation. Individuals from a least deprived area had 44% lower odds of being diagnosed with cancer in ED settings compared to most deprived areas. For a diagnosis of cancer post CVD there was a 41% decreased odds of diagnosis in ED for least deprived areas compared to most deprived areas.

Conclusions

Area level deprivation had an important impact on both survival of individuals diagnosed with cancer and/or CVD and setting of diagnosis. With 5- and 6-times larger hazards of death when diagnoses were made in ED rather than non-ED, and over 40% decreased odds of diagnosis in ED for least deprived areas compared to most deprived.

[1] Deaths registered in England and Wales: 2023, January 2025, Office for National Statistics
[2] Digital Health and Care Wales: APC Statistics – Data for the period 1st April to 31st March 2025
[3] Jane Lyons et al. Protocol for the development of the Wales Multimorbidity e-Cohort (WMC): data sources and methods to construct a population-based research platform to investigate multimorbidity.