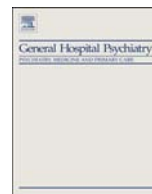




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Cancer survival in the context of mental illness: a national cohort study

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ABSTRACT

Objective: To explore the reasons for worse cancer survival in people with experience of mental illness, including differences by cancer type and psychiatric diagnosis.**Method:** New Zealand breast and colorectal cancer registrations (2006–2010) were linked to psychiatric hospitalization records for adults (18–64 years). Cancer-specific survival was compared for recent psychiatric service users and nonusers using Cox regression. The contributions of deprivation, comorbidity and stage at diagnosis were assessed for those with schizophrenia or bipolar affective disorder (Group A) and others using mental health services (Group B).**Results:** Of 8762 and 4022 people with breast and colorectal cancer respectively, 440 (breast) and 190 (colorectal) had recent contact with psychiatric services. After adjusting for confounding, risk of death from breast cancer was increased for Group A [Hazard Ratio (HR) 2.55 (95% confidence interval 1.49–4.35)] and B [HR 1.62 (1.09–2.39)] and from colorectal cancer for Group A [HR 2.92 (1.75–4.87)]. Later stage at diagnosis contributed to survival differences for Group A, and comorbidity contributed for both groups. Fully adjusted HR estimates were breast: Group A 1.65 (0.96–2.84), B 1.41 (0.95–2.09); colorectal: Group A 1.89 (1.12–3.17), B 1.25 (0.89–1.75)].**Conclusions:** The high burden of physical disease and delayed cancer diagnosis in those with psychotic disorders contributes to worse cancer survival in New Zealand psychiatric service users.

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1. Background

Experience of mental illness is associated with adverse physical health outcomes. People with mental illness have higher rates of many physical illnesses than others in the population and also fare worse once diagnosed with physical conditions [1–3]. Understanding the pathways that lead from experience of mental illness to worse outcomes from physical health conditions is crucial in enabling health services to improve outcomes for this group.

Cancer is a leading cause of death in those with mental illness in developed countries [4,5], and while cancer incidence rates have generally been found to be comparable between people with and without a history of mental illness, cancer mortality is higher [6]. Cancer mortality depends on cancer incidence and cancer survival. The small number of studies which have examined the impact of mental illness on cancer survival has found disparities across cancer types, mental health diagnoses and settings [7–11]. There is some evidence to suggest that these survival disparities may be due to later diagnosis [10] and being less likely to receive treatment for cancer [11]. However few studies have had the power to investigate the contribution of specific factors to cancer survival disparities.

There are a number of possible pathways to apparently worse cancer survival. The difference in survival may be due to confounding – the age, sex and ethnicity of those with experience of mental illness may explain the differences seen in cancer survival. The higher burden of physical illnesses such as diabetes, heart disease and liver disease among those with mental illness compared to those without may impact on survival both directly and through ability to tolerate cancer treatments. People with mental illness may be less likely to access primary care services, or their mental illness may overshadow their cancer symptoms when they do, resulting in cancers being diagnosed later with worse prognosis. Finally, health care quality, or the likelihood of receiving appropriate and timely treatment once diagnosed, may impact on subsequent survival.

This study uses information from a national mental health service dataset linked to a national cancer registry to answer two questions: first, what is the relative importance of the different drivers of cancer survival (particularly stage and comorbid illness) in explaining differences in survival after diagnosis with common cancers for those with mental illness, and second, how does the role of these drivers differ by psychiatric diagnosis and cancer type?

2. Methods

We examined 5-year survival in a cohort of adults diagnosed with breast or colorectal cancers between 1/1/2006 and 31/12/2010 and compared those in contact with public psychiatric services in the 5

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years prior to cancer diagnosis to those without such a history. Breast and colorectal cancers were chosen as the two most commonly registered cancers in New Zealand (aside from prostate cancer) [12].

2.1. Participants

Adults, usually resident in New Zealand, who were diagnosed with incident breast cancer (ICD10 codes: C50x) or colorectal cancer (ICD10 codes: C18x C19x C20x) between 1/01/2006 and 31/12/2010, and were aged 18–64 at cancer diagnosis.

2.2. Data sources

All data were extracted from collections held by the New Zealand Ministry of Health, which were linked using the National Health Index (a unique identifying number that is assigned to all individuals who use health services in New Zealand) and subsequently anonymised. Data on cancer diagnosis came from the New Zealand Cancer Registry, a population-based register of all malignant cancers diagnosed in New Zealand (except nonmelanoma skin cancers), with mandatory reporting by laboratories and clinicians. Data on psychiatric service use came from the Mental Health Information National Collection (1/1/2001–30/6/2008) and Project for Integration of Mental Health Data (1/7/2008–31/12/2010) data collections, which record data on all public inpatient and outpatient mental health service use in those aged over 65. Data on mortality and cause of death were drawn from the New Zealand Mortality Data Collection, which records all deaths occurring in New Zealand. Data on comorbid diagnoses were drawn from the National Minimum Data Set, which records all inpatient public secondary care contacts.

2.2.1. Exposure

Recent mental illness was defined as mental illness that has been disruptive enough to lead to contact with adult secondary mental health services (for assessment and/or treatment) in the 5 years prior to cancer diagnosis. In order to separately investigate the pathways for different types of mental illness, participants with mental health service use were divided into those with any diagnosis of schizophrenia, schizoaffective disorder, bipolar affective disorder, or other nonorganic psychosis (ICD10 codes: F20, F25, F28, F29, F30, F31) (Group A) and those with any other recorded psychiatric diagnoses or no psychiatric diagnosis recorded (Group B). The remainder of the cohort (with no recorded contact) was treated as the reference group for calculation of hazards ratios. Contact with inpatient psychiatric services over the 5 years prior to cancer diagnosis was also used as an alternative measure of severity as a sensitivity analysis.

2.2.2. Outcomes

Cancer-specific survival (where cancer was identified as the underlying cause of death on the death certificate) was used as the primary outcome (those dying of noncancer causes were censored at time of death). All-cause survival was also estimated with mortality for any cause being treated as the event of interest. Participants who were still alive at the end of the follow-up period were treated as censored in both analyses.

2.3. Variables

Age at cancer diagnosis was calculated from date of diagnosis and date of birth. Age was modeled in the survival analyses using a restricted cubic spline function with three knots (knots at 10th, 50th and 90th percentiles). Sex was used as recorded on the Cancer Registry (male or female), and this information was complete for all of those identified in the cohort.

Ethnic group, as recorded on the Cancer Registry, was used. There are four main ethnic groups in New Zealand: the indigenous Maori population (14%) and European (70%), Pacific (7%) and Asian (11%) groups

[13]. Multiple ethnic identities can be recorded on the Cancer Registry, but for reporting, a single prioritized group is used, with the prioritization order of Maori, then Pacific, then Asian and then a residual group. For the analyses reported here, the indigenous Maori population was compared with all other (non-Maori) groups. Those with missing ethnicity information were included in the non-Maori group. Further analysis by ethnic group was limited by small numbers.

Level of deprivation was measured using the NZDep (2006) index, which is a small area measure of deprivation based on data from the 2006 Census [14]. Deprivation level was missing where information on area of residence at the time of cancer diagnosis was not available (about 2%), and these data were imputed using values from multiple other variables [age, sex (for colorectal cancer), ethnicity, cancer stage, comorbidity score and whether the person died] to predict likely deprivation score. The Proc MI (multiple imputation) procedure was used in the analytic programme SAS, and five output datasets were created. Deprivation quintiles were used in survival analysis.

The C3 comorbidity index [15] was used to estimate level of comorbid illness present at the time of cancer diagnosis. This index, specifically developed to measure comorbidity in the context of cancer using administrative hospitalization data, includes up to 42 conditions. For the C3 index, conditions are identified from ICD-10 coded diagnoses recorded for any hospitalization event for a given patient in the 5 years prior to cancer diagnosis. Each condition is weighted according to its impact on a 1-year noncancer mortality (as a mark of severity). The weights are summed to give an overall index score for each patient, with a higher score indicating a higher level of comorbidity. The index was adapted for the current study to exclude psychiatric diagnoses. Comorbidity was modeled using a restricted cubic spline function using three knots for the survival analysis (for breast cancer knots at 0, 0.5 and 1.3; for colorectal cancer knots at 0, 0.5 and 2.0) [16]. For the descriptive analysis C3 scores were divided into three categories: 0, 1–2 and 3+.

Stage at diagnosis is recorded on the Cancer Registry based on all available information on staging within 3 months of diagnosis. The SEER (Surveillance Epidemiology and End Results Programme) summary staging system is used, and this was converted into local, regional and distant disease for analyses. Those with missing stage data were treated as having unstaged disease, and this was used as a stage category.

2.4. Analysis

Breast and colorectal cancer cohorts with a history of recent mental health service use (in the 5 years prior to cancer diagnosis) were compared to those without such a history in terms of demographics, cancer characteristics and comorbidity. Kaplan Meir survival curves for cancer-specific mortality were estimated for those with and without a history of mental health service use and visually compared to assess proportionality of hazards. Cox proportional hazards modeling was used to compare cancer-specific and all-cause survival between those with recent mental health service use and those without and to investigate the contribution of demographic confounders (age, sex, ethnicity) and factors likely to be on the causal pathway (deprivation, comorbidity and stage at diagnosis). Survival estimates were also produced using the Fine Gray method which takes into account deaths from competing causes [17] to check for any bias due to analysis method selection. A directed acyclic graph (DAG) was used to plot the assumed causal relationships investigated (see Fig. 1). The maximum postdiagnosis follow-up time for the survival analysis was 5 years.

All analysis was performed using SAS version 9.3.

Ethical approval for this study was granted by the New Zealand Multi-region Ethics Committee (reference number MEC/12/05/046).

3. Results

We identified 8762 women with a diagnosis of breast cancer, of whom 440 had had contact with mental health services in the 5 years

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