Suicide after cancer diagnosis in South Korea: a population-based cohort study

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ABSTRACT

Objective The present study aimed to determine whether the suicide risk increased after a cancer diagnosis.

Design Population-based cohort study.

Setting and participants This study incorporated the National Health Insurance Service-National Sample Cohort in South Korea. Of the 975,348 subjects, 39,027 with cancer and 936,321 who were cancer free participated between 2005 and 2013.

Primary outcome measure Suicide.

Results A total of 110 suicides (82 men, 28 women) were identified among these 39,027 subjects with cancer during a total of 127,184 person-years; among the 936,321 cancer-free subjects, 2,163 suicides were reported during a total of 8,222,479 person-years. Cox proportional hazards models were used to compare all-cause and suicide mortalities after cancer diagnosis following adjustment for possible confounding covariates. After adjusting for factors related to suicide, we identified an elevated relative risk of suicide among patients with cancer (HR: 1.480, 95% CI: 1.209 to 1.812). Among men, the relative risk was substantially increased among patients with lip, oral cavity/pharyngeal, colon and rectal, pancreatic and lung cancers when compared with cancer-free subjects; whereas among women, the relative risk was substantially increased among patients with colon and rectal cancers.

Conclusion Our study observed an increased risk of suicide among patients with cancer that varied according to the anatomical cancer site, even after accounting for clinical comorbidities and psychiatric illness. Our findings indicate a need for social support and suicide prevention strategies for patients with cancer.

INTRODUCTION

Suicide is considered a major public health challenge and is among the leading global causes of a loss of life years. Notably, South Korea has the highest suicide rate among member nations of the Organization for Economic Co-operation and Development. Suicide rates have continued to increase in South Korea throughout the past two decades with a peak in 2010, leading to the current designation of suicide as the fourth leading cause of death nationwide.

A cancer diagnosis is a stressful and life-threatening event that causes considerable physical and psychological suffering. The associated distress might not only worsen the quality of life and accelerate disease progression, but may also promote non-cancer mortality. Patients with cancer, particularly, have a higher risk of suicide relative to that of the general population, and this risk may increase by up to twofold in many countries. A large body of evidence has identified many factors related to suicide among patients with cancer, including particular clinical characteristics, age at diagnosis, prognosis, stage, time since diagnosis, psychiatric health, and sociodemographic factors such as sex, race, and marital status. Previous studies also have found that the incidence of suicide is relatively high among patients with pancreatic, lung, colon and rectal, oral cavity/pharyngeal, stomach, and cervical cancer.

Despite the accumulation of evidence in support of an association between cancer and suicide, several studies have calculated the standardised mortality ratios (SMRs) to compare the suicide rate between patients with cancer and the general population while only evaluating differences in sociodemographic and clinical characteristics.
Additionally, previous studies have been limited by a failure to adjust for underlying psychiatric conditions, particularly as cancer itself has been identified as a suicide risk factor when coupled with comorbidities such as psychiatric disease. Therefore, we investigated whether the suicide rate is higher among Korean patients with cancer than among the general population after controlling for underlying diseases including psychiatric disorders as well as sociodemographic and clinical characteristics. We further compared the risk of suicide according to the anatomical site of cancer with the risk observed in the general population.

METHODS AND MATERIALS

Data sources
As described in detail previously, data were acquired from the National Health Insurance Service-National Sample Cohort (NHIS-NSC) from 2002 to 2013 and included 1025340 representative subjects (2.2% of the population) who were randomly stratified and selected based on age, sex, insurance type, income, residential region and individual total medical costs at 2002. As all Korean citizens are obligated to enrol in the single-payer, national health insurance and medical aid programme administered by the National Health Insurance Corporation, this sample cohort is representative of the general Korean population. The NHIS-NSC database includes information regarding patients’ unique de-identification numbers, age, sex, insurance type, diagnosis according to the International Classification of Diseases (ICD-10), medical costs and prescribed drugs. In addition, these numbers are linked to mortality information from the Korean National Statistical Office (KNSO). By law, all causes of death must be reported to the KNSO within 1 month of occurrence. Details of the NHIS-NSC database have been provided in a previous report.

Study participants and follow-up
Of the 1 025 340 subjects, we eliminated 17297 patients who had been diagnosed with cancer between 2002 and 2004, thus ensuring the selection of cancer-free subjects at baseline. We additionally eliminated 32095 subjects for whom information was missing due to a follow-up loss (death, emigration or disqualification from national health insurance) between 2002 and 2004. Overall, this study included 975348 subjects (online supplemental figure 1).

Outcome and follow-up
The outcome variables for this study were all-cause mortality and suicide (ICD-10 code X64–80). All subjects were observed from 1 January 2005 to follow-up loss, death (by suicide or any other cause) or 31 December 2013, whichever occurred first. For subjects who did not develop cancer, follow-up ended on the date of suicide, other death, emigration or 31 December 2013, whichever occurred first; accumulated person-time was defined as the exposed person-time. For those who were diagnosed with cancer, the follow-up ended with the occurrence of suicide, other death, emigration out of Korea or 31 December 2013, whichever came first; accumulated person-time was defined as the exposed person-time. Participants diagnosed with cancer during the study period contributed unexposed person-time prior to the date of diagnosis (as recorded in the national health insurance data) and exposed person-time thereafter.

Cancer diagnosis
Cancer diagnoses were organised into 13 diagnostic groups: lip, oral cavity and pharynx (ICD-10 codes C00, C11, C12, C13, C14); stomach (C16); colon and rectum (C17, C18, C19, C20, C21); liver (C22); gallbladder and pancreas (C23, C24, C25); lung (C33, C34); breast (C50); gynaecological (cervix, uterus and ovary: C53, C54, C56); prostate (C61); testis and other male genital organs (C62); bladder (C67); thyroid (C73); and others (oesophagus: C15; larynx: C32; skin: C43, C44; kidney: C64, C65, C66, C68; brain and central nervous system: C70, C71, C72; Hodgkin’s lymphoma: C81; non-Hodgkin’s lymphoma: C82, C83, C84, C85, C96; leukaemia: C91, C92, C93, C94, C95).

Covariates
Sociodemographic and clinical risk factors for suicide were included in this study. Sociodemographic factors recorded on the date of entry into the study included sex, age (≤39, 40–49, 50–59, 60–69 and ≥70 years), region (urban or rural) and household income (income quintiles Q1 (low) to Q5 (high)). We used the average monthly insurance premium as a proxy for household income. In Korea, individuals qualify for medical aid if their household income is less than $600 per month; otherwise, they qualify for national health insurance. Individuals enrolled in the national health insurance programme were distributed between the 1st and 100th income percentiles, whereas those receiving medical aid were classified at the zero percentile. In this study, the following household income classification was used: Q1, <20%; Q2, 21%–40%; Q3, 41%–60%; Q4, 61%–80% and Q5, >80%. We also included the experience of at least one disability (according to the disabled person welfare law), including intellectual disability, brain lesion, deafness, physical disability, visual impairment, mental disorder, kidney disorder, language disorder, autism, heart disability, respiratory disorder, hepatopathy, facial disorders, having undergone ostomy and epilepsy.

Regarding clinical factors, patients’ comorbidities were identified via review of their medical histories 12 months prior to study entry. Using the Charlson Comorbidity Index, we measured 17 comorbidities to control for the case mix. Additionally, underlying diagnoses related to psychiatric disorders included substance abuse (F10–F19), schizophrenia disorder (F20–F29), bipolar disorder...
Table 1  Characteristics of study participants comparing between patients with cancer and those who were cancer free

| Characteristic                  | Total      | Cancer     | All-cause mortality | Suicide | Cancer free | All-cause mortality | Suicide |
|-------------------------------|------------|------------|---------------------|---------|-------------|---------------------|---------|
|                               | n          | %          | PY                  | n       | %*         | PY                  | n       |
| Total                         | 975348     | 39027      | 127184              | 10789   | 27.64      | 110                 | 0.28    |
| Sex                           |            |            |                     |         |            |                     |         |
| Male                          | 487620     | 49.99      | 19191               | 56723   | 35.74      | 82                  | 0.43    |
| Female                        | 487728     | 50.01      | 19836               | 70461   | 19.81      | 28                  | 0.14    |
| Age                           |            |            |                     |         |            |                     |         |
| ≤39                           | 563511     | 57.78      | 4046                | 16769   | 318        | 1                   | 0.02    |
| 40–49                         | 170799     | 17.51      | 6226                | 23865   | 766        | 16                  | 0.26    |
| 50–59                         | 107302     | 11.00      | 8625                | 29806   | 1608       | 21                  | 0.24    |
| 60–69                         | 74493      | 7.64       | 9122                | 30926   | 2602       | 28                  | 0.31    |
| ≥70                           | 59243      | 6.07       | 11008               | 25818   | 5495       | 44                  | 0.40    |
| Income                        |            |            |                     |         |            |                     |         |
| Q1 (low)                      | 159583     | 16.36      | 6953                | 19998   | 2357       | 21                  | 0.30    |
| Q2                            | 148029     | 15.18      | 5183                | 16891   | 1480       | 14                  | 0.27    |
| Q3                            | 182919     | 18.75      | 6309                | 20634   | 1810       | 12                  | 0.19    |
| Q4                            | 222648     | 22.83      | 8012                | 27231   | 2044       | 32                  | 0.40    |
| Q5 (high)                     | 262169     | 26.88      | 12570               | 42431   | 3998       | 31                  | 0.25    |
| City                          |            |            |                     |         |            |                     |         |
| Rural                         | 303762     | 31.14      | 13516               | 43288   | 4126       | 30                  | 0.33    |
| Urban                         | 671586     | 68.86      | 25511               | 83896   | 6663       | 26                  | 0.31    |
| Disability                    |            |            |                     |         |            |                     |         |
| No                            | 937155     | 96.08      | 34639               | 115090  | 9032       | 88                  | 0.25    |
| Yes                           | 38193      | 3.92       | 4388                | 12094   | 1757       | 22                  | 0.50    |
| Charlson Comorbidity Index    |            |            |                     |         |            |                     |         |
| 0                             | 773214     | 79.28      | 17047               | 60965   | 3503       | 42                  | 0.25    |
| 1                             | 162128     | 16.62      | 13327               | 42582   | 3963       | 37                  | 0.28    |
| 2                             | 28415      | 2.91       | 5283                | 15114   | 1917       | 20                  | 0.38    |
| ≥3                            | 11591      | 1.19       | 3370                | 8524    | 1406       | 11                  | 0.33    |
| Substance abuse               |            |            |                     |         |            |                     |         |
| No                            | 974052     | 99.87      | 38839               | 126696  | 10701      | 105                 | 0.27    |
| Yes                           | 1296       | 0.13       | 188                 | 488     | 88         | 5                   | 2.66    |
| Schizophrenia                 |            |            |                     |         |            |                     |         |
| No                            | 972723     | 99.73      | 38887               | 126828  | 10728      | 110                 | 0.28    |
| Yes                           | 2625       | 0.27       | 140                 | 357     | 61         | 0                   | 0.00    |

Continued
| Characteristic            | Total | Cancer | All-cause mortality | Suicide | Cancer free | All-cause mortality | Suicide |
|--------------------------|-------|--------|---------------------|---------|-------------|---------------------|---------|
|                          | n     | %      | n                  | %       | PY          | n                  | %       |
| No                       | 974537| 99.92  | 38332              | 99.76   | 126999      | 10761              | 27.64   |
|                          |       |        | 108                | 0.28    |             | 935605             | 99.92   |
|                          |       |        |                     |         |             | 8218249            | 30624   |
|                          |       |        |                     |         |             | 3.27               | 2147    |
|                          |       |        |                     |         |             | 0.23               |         |
| Yes                      | 811   | 0.08   | 95                 | 0.24    | 195         | 28                 | 29.47   |
|                          |       |        |                     | 2       | 1.11        | 716                | 0.08    |
|                          |       |        |                     |         |             | 6230               | 53      |
|                          |       |        |                     |         |             | 7.40               | 16      |
|                          |       |        |                     |         |             | 2.23               |         |
| Major depressive disorder| No    | 964018 | 98.84              | 37644   | 96.46       | 123124             | 27.54   |
|                          |       |        | 103                | 0.27    |             | 926374             | 98.94   |
|                          |       |        |                     |         |             | 8136480            | 29787   |
|                          |       |        |                     |         |             | 3.22               | 2028    |
|                          |       |        |                     |         |             | 0.22               |         |
|                          | Yes   | 11330  | 1.16               | 1383    | 3.54        | 4060               | 30.51   |
|                          |       |        | 7                  | 0.51    |             | 9947               | 1.06    |
|                          |       |        |                     |         |             | 85999              | 890     |
|                          |       |        |                     |         |             | 8.95               | 135     |
|                          |       |        |                     |         |             | 1.36               |         |
| Stress-related disorders | No    | 943433 | 96.73              | 35604   | 91.23       | 116429             | 27.30   |
|                          |       |        | 102                | 0.29    |             | 907829             | 96.96   |
|                          |       |        |                     |         |             | 7971462            | 28968   |
|                          |       |        |                     |         |             | 3.19               | 1996    |
|                          | Yes   | 31915  | 3.27               | 3423    | 8.77        | 10755              | 31.26   |
|                          |       |        | 8                  | 0.23    |             | 28492              | 3.04    |
|                          |       |        |                     |         |             | 251017             | 1709    |
|                          |       |        |                     |         |             | 6.00               | 167     |
|                          |       |        |                     |         |             | 0.59               |         |
| Sleep disorders          | No    | 965698 | 99.01              | 37165   | 95.23       | 122067             | 27.38   |
|                          |       |        | 103                | 0.28    |             | 928533             | 99.17   |
|                          |       |        |                     |         |             | 8155600            | 29788   |
|                          |       |        |                     |         |             | 3.21               | 2082    |
|                          | Yes   | 9650   | 0.99               | 1862    | 4.77        | 5117               | 32.98   |
|                          |       |        | 7                  | 0.38    |             | 7788               | 0.83    |
|                          |       |        |                     |         |             | 66879              | 889     |
|                          |       |        |                     |         |             | 11.41              | 81      |
|                          |       |        |                     |         |             | 1.04               |         |
| Personality disorders    | No    | 975030 | 99.97              | 39014   | 99.97       | 127158             | 27.64   |
|                          |       |        | 109                | 0.28    |             | 936016             | 99.97   |
|                          |       |        |                     |         |             | 8219825            | 30660   |
|                          |       |        |                     |         |             | 3.28               | 2155    |
|                          | Yes   | 318    | 0.03               | 13      | 0.03        | 27                 | 53.85   |
|                          |       |        |                     | 7       | 7.69        | 305                | 0.03    |
|                          |       |        |                     |         |             | 2654               | 17      |
|                          |       |        |                     |         |             | 5.57               | 8       |
|                          |       |        |                     |         |             | 2.62               |         |

*% of patients with cancer or subjects who were cancer free.
PY, person-years.
(F31), major depressive disorder (F32–F33), anxiety and stress disorders (F40–F48), sleep disorders (F51, G47) and personality disorders (F6).

Statistical analysis
For this study, we determined the distributions of general characteristics by diagnosis of cancer. Additionally, relationships between household income level and suicide were analysed using time-to-event methods. The Kaplan-Meier method was used to generate curves of unadjusted mortality rates, which were compared using the log-rank test. To determine whether the suicide rate was higher among patients with cancer relative to the general population, multivariable analyses involving Cox proportional hazards models were conducted to calculate adjusted HRs plus 95% CIs as estimates of relative suicide rates. The proportionality assumption was tested by examining log curves (−log (survivor function)) versus time. A p value of <0.05 was considered to indicate statistical significance. All statistical analyses were conducted using the SAS software package (V.9.4; SAS Institute).

Patient and public involvement
Patients and the public were not involved in the design or planning of this study.

RESULTS
Table 2 presents the results of a Cox proportional hazards analysis of the association between cancer diagnosis and suicide risk. Even after adjusting for factors related to suicide among patients with cancer, we observed an elevated relative risk of suicide (HR: 1.480, 95% CI: 1.209 to 1.812). Notably, the relative suicide risk was significantly more elevated among male subjects (HR: 1.513, 95% CI: 1.191 to 1.922), compared with female subjects (HR: 1.320, 95% CI: 0.895 to 1.947). Higher suicide rates were found to associate with male sex, older age, lower income, presence of a disability, higher Charlson Comorbidity Index and presence of psychiatric illness.

Figures 2–4 present the adjusted risks of suicide according to anatomical cancer site in both male and female subjects. Among men, the relative risk was increased substantially for patients with lip, oral cavity and pharyngeal cancer (HR: 1.987, 95% CI: 1.025 to 3.853), colon and rectal (HR: 1.906; 95% CI: 1.174 to 3.093), pancreatic (HR: 3.777; 95% CI: 1.211 to 11.784) and lung cancers (HR: 2.502; 95% CI: 1.463 to 4.280), compared with the cancer-free group. Among women, the relative risk was substantially increased for patients with colon and rectal cancers (HR: 2.376, 95% CI: 1.120 to 5.041).

DISCUSSION
Summary
In this population-based cohort study, we used data from the NHIS-NSC to investigate whether the risk of suicide was higher among patients with cancer than among the general population. We found that the suicide risk was indeed higher among those diagnosed with cancer during the study period, and that the risk of suicide varied according to the anatomical cancer site, as men diagnosed with lip, oral cavity and pharyngeal, colon and rectal, liver, pancreatic and lung cancers and women diagnosed with colon and rectal cancers had a significantly higher risk of suicide relative to the general population.

Comparison with studies
Our findings were consistent with those of other studies that examined the relationship between cancer diagnosis and suicide, in which the incidence rates of suicide among male and female patients with cancer were, respectively, 1.5 and 1.3 times higher than the rates in the general population after adjusting for factors associated with suicide. Similarly, in the USA, the suicide risk among patients with cancer is approximately twofold of the risk in the general population,13 and European studies have also observed increased suicide rates among patients with cancer. For example, Yousaf et al.3 calculated SMRs of 1.7 and 1.4 for suicide among men and women, respectively, from a Danish cancer registry relative to the general Danish population. A similar study in Norway reported SMRs of 1.55 and 1.35.12 In Sweden, Björkenstam et al.11 observed SMRs of 2.5 (men and women combined) for the period from 1965 to 1974 and 1.5 for the period from...
| Cancer       | Overall suicide (male + female) | Male                | Female               |
|--------------|---------------------------------|---------------------|----------------------|
| Yes          | HR 1.480                        | 95% CI 1.209 to 1.812 | P value 0.000       |
|              | 1.513                           | 95% CI 1.191 to 1.922 | 0.001                |
| No           | 1.000                           | 1.000               | 1.000                |

| Sex          |                                  |                     |                      |
|--------------|----------------------------------|---------------------|----------------------|
| Male         | HR 2.332                         | 95% CI 2.133 to 2.549 | <0.0001             |
| Female       | 1.000                            |                     |                      |

| Age          |                                  |                     |                      |
|--------------|----------------------------------|---------------------|----------------------|
| ≤39          | 1.000                            | 1.000               | 1.000                |
| 40–49        | 1.906                            | 95% CI 1.696 to 2.143 | <0.0001             |
|              | 2.252                           | 95% CI 1.952 to 2.598 | <0.0001             |
| 50–59        | 2.098                            | 95% CI 1.837 to 2.396 | <0.0001             |
|              | 2.799                           | 95% CI 2.394 to 3.272 | <0.0001             |
| 60–69        | 3.281                            | 95% CI 2.871 to 3.750 | <0.0001             |
|              | 4.360                           | 95% CI 3.713 to 5.120 | <0.0001             |
| ≥70          | 6.355                            | 95% CI 5.561 to 7.263 | <0.0001             |
|              | 7.875                           | 95% CI 6.611 to 9.381 | <0.0001             |

| Income       |                                  |                     |                      |
|--------------|----------------------------------|---------------------|----------------------|
| Q1 (low)     | 1.972                            | 95% CI 1.742 to 2.233 | <0.0001             |
| Q2           | 1.692                            | 95% CI 1.479 to 1.936 | <0.0001             |
| Q3           | 1.352                            | 95% CI 1.180 to 1.549 | <0.0001             |
| Q4           | 1.287                            | 95% CI 1.130 to 1.465 | 0.000               |
| Q5 (high)    | 1.000                            | 1.000               | 1.000                |

| City         |                                  |                     |                      |
|--------------|----------------------------------|---------------------|----------------------|
| Rural        | 1.087                            | 95% CI 0.997 to 1.185 | 0.058               |
|              | 1.098                           | 95% CI 0.988 to 1.221 | 0.082               |
|              | 1.081                           | 95% CI 0.930 to 1.256 | 0.310               |
| Urban        | 1.000                            | 1.000               | 1.000                |

| Disability   |                                  |                     |                      |
|--------------|----------------------------------|---------------------|----------------------|
| No           | 1.000                            | 1.000               | 1.000                |
| Yes          | 1.669                            | 95% CI 1.457 to 1.912 | <0.0001             |
|              | 1.723                           | 95% CI 1.479 to 2.006 | <0.0001             |
|              | 1.304                           | 95% CI 0.955 to 1.782 | 0.095               |

| Charlson Comorbidity Index | Overall suicide (male + female) | Male                | Female               |
|----------------------------|---------------------------------|---------------------|----------------------|
| 0                          | 1.000                           | 1.000               | 1.000                |
| 1                          | 0.935                            | 95% CI 0.836 to 1.046 | 0.243               |
|                            | 0.901                           | 95% CI 0.783 to 1.038 | 0.149               |
|                            | 0.899                           | 95% CI 0.823 to 1.188 | 0.905               |
| 2                          | 1.225                            | 95% CI 1.018 to 1.475 | 0.032               |
|                            | 1.367                           | 95% CI 1.093 to 1.710 | 0.006               |
|                            | 0.986                           | 95% CI 0.706 to 1.377 | 0.933               |
| ≥3                         | 1.328                            | 95% CI 1.031 to 1.710 | 0.028               |
|                            | 1.381                           | 95% CI 1.017 to 1.874 | 0.039               |
|                            | 1.254                           | 95% CI 0.798 to 1.971 | 0.327               |

| Substance abuse           | Overall suicide (male + female) | Male                | Female               |
|----------------------------|---------------------------------|---------------------|----------------------|
| No                         | 1.000                           | 1.000               | 1.000                |
| Yes                        | 3.196                            | 95% CI 2.210 to 4.622 | <0.0001             |
|                            | 3.049                           | 95% CI 2.010 to 4.625 | <0.0001             |
|                            | 4.742                           | 95% CI 2.082 to 10.804 | 0.000               |

| Schizophrenia             | Overall suicide (male + female) | Male                | Female               |
|----------------------------|---------------------------------|---------------------|----------------------|
| No                         | 1.000                           | 1.000               | 1.000                |
| Yes                        | 4.004                            | 95% CI 2.974 to 5.390 | <0.0001             |
|                            | 4.366                           | 95% CI 3.021 to 6.310 | <0.0001             |
|                            | 3.507                           | 95% CI 2.112 to 5.823 | <0.0001             |
In Asia, a Korean study used cancer registry data to calculate SMRs of 2.05 among male patients and 1.87 among female patients for the period from 1993 to 2005. Several studies have found associations of cancers at certain anatomical sites with particularly elevated suicide rates. However, reports differ with regard to the anatomical sites associated with the greatest suicide risks. In our study of patients in Korea, we found that the suicide risks were especially high among male patients with lip, oral cavity and pharyngeal, colon and rectal, liver, pancreatic, and lung cancers and among female patients with colon and rectal cancer, findings that were concordant with reports from Western countries. Although the reasons underlying the associations of particular cancer types with increased suicide rates are unknown, a high prevalence of depression has been observed among patients with head and neck cancers.

| Overall suicide (male + female) | Male | Female |
|-------------------------------|------|--------|
| Bipolar disorders              |      |        |
| No                            | 1.000| 1.000  |
| Yes                           | 1.912| 2.264  |
| Major depressive disorder      |      |        |
| No                            | 1.000| 1.000  |
| Yes                           | 2.891| 2.339  |
| Stress-related disorders       |      |        |
| No                            | 1.000| 1.000  |
| Yes                           | 1.349| 1.449  |
| Sleep disorders                |      |        |
| No                            | 1.000| 1.000  |
| Yes                           | 1.717| 1.377  |
| Personality disorders          |      |        |
| No                            | 1.000| 1.000  |
| Yes                           | 2.949| 3.428  |

Table 2

Continued
provide further evidence of a relationship between cancer diagnosis and suicide. Further research into the suicide risks of patients with cancer should extend the range of concerns to include disease stage and clinical treatment.

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Ethics approval  This study adhered to the tenets of the Declaration of Helsinki. The study design was reviewed and approved by the ethical review board at the Graduate School of Public Health in Yonsei University (2-1040939-AB-N-01-2014-239). Since our study used administrative cohort data, the requirement for informed consent was waived as the National Health Insurance Service-National Sample Cohort was constructed after anonymisation according to strict confidentiality guidelines.

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CONCLUSION

In our study of a cohort representative of the Korean population, patients with cancer were found to exhibit an increased risk of suicide, which varied according to the anatomical cancer site even after accounting for clinical comorbidities and psychiatric illness. These results

Figure 4  Adjusted risks of suicide by cancer type (women).
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