RWD2

# ESTIMATING RECURRENCE AFTER LUNG CANCER RESECTION USING CLAIMS DATA: A COMPETING RISKS ANALYSIS IN CHINA

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**KEY MESSAGE** Within 24 months of lung cancer surgery, 14.2% of patients had a claims-recorded recurrence and 7.5% died before recurrence, more often among older patients, men, and patients with comorbidity. Claims can yield these estimates, but absolute values depend on how recurrence is ascertained.

## BACKGROUND

- Lung cancer is the leading cause of cancer incidence and cancer death in China.
- Recurrence after resection is common and strongly influences prognosis, treatment, and follow-up, but population-level estimates are lacking in China.
- Insurance claims record diagnoses, procedures, and dispensing, but to our knowledge have not been used to estimate postoperative recurrence in China.

## OBJECTIVE

To estimate the cumulative incidence of postoperative recurrence and of death before recurrence after lung cancer surgery, and to identify baseline factors associated with recurrence, using administrative health insurance claims from a province in China.

## METHODS

**Study design and data source:** retrospective population-based cohort using province-wide basic medical insurance claims from an eastern coastal province of China.

**Study population:** adults with a first recorded primary lung cancer (ICD-10 C34) in 2022 who underwent lung resection by December 31, 2022 (≥6-month look-back); followed through December 31, 2024.

**Outcomes:** claims-identified recurrence, defined as the earliest metastatic diagnosis code (C77–C79, excluding C78.0) or treatment record for recurrent disease (surgery, radiotherapy, systemic therapy, or ablation) from 6 months after surgery; death before recurrence as the competing event.

**Covariates:** age at index date, sex, basic medical insurance scheme (urban employee vs urban and rural resident), and non-cancer Charlson Comorbidity Index (CCI).

**Statistical analysis:** cumulative incidence functions; multivariable Fine–Gray models; cause-specific Cox models; sensitivity analyses varying the blackout period (3–9 months) and age coding.

**Index date: lung-resection admission**

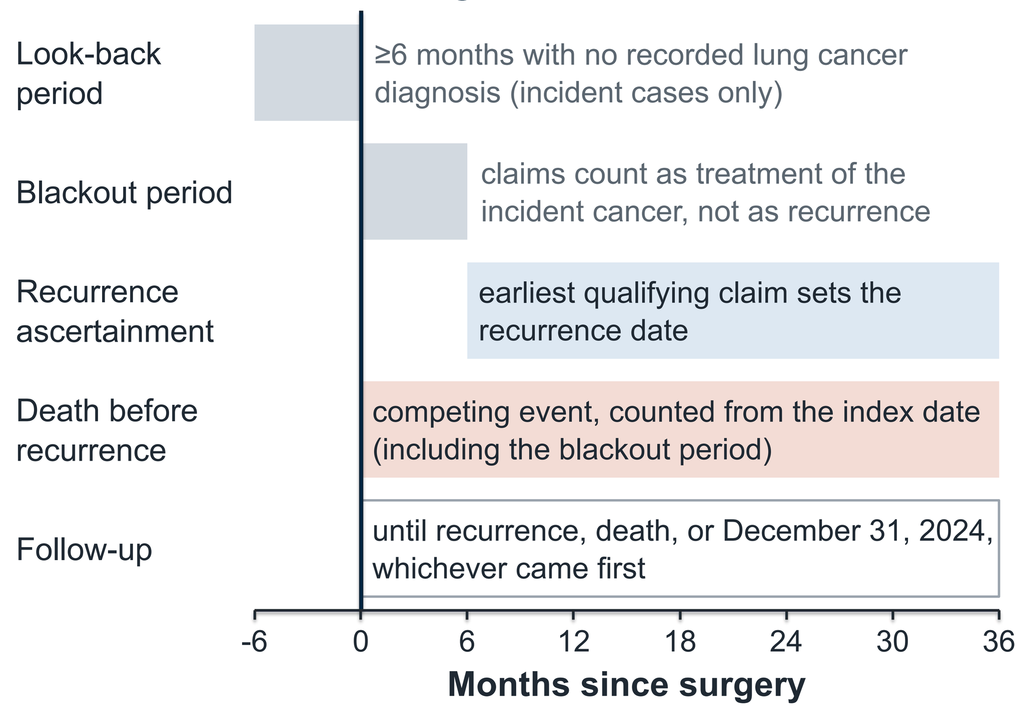



**Figure 2.** Study design and claims-based ascertainment of postoperative recurrence.

## COHORT CHARACTERISTICS

**Figure 1. Cohort identification and patient selection**

**24,393** screened, 2022–2023 → **7,946** first diagnosis in 2022 → **7,823** resection by Dec 31, 2022 → **7,822** analytic cohort

- Mean age 60.8 years; 4,326 (55.3%) female; 7,156 (91.5%) enrolled in Urban Employee Basic Medical Insurance (UEBMI) and 666 (8.5%) in Urban and Rural Resident Basic Medical Insurance (URRBMI); non-cancer CCI 0 / 1 / ≥2: 79.8% / 14.0% / 6.2%.
- **During follow-up:** recurrence 1,166 (14.9%); death before recurrence 991 (12.7%); alive and recurrence-free 5,665 (72.4%).

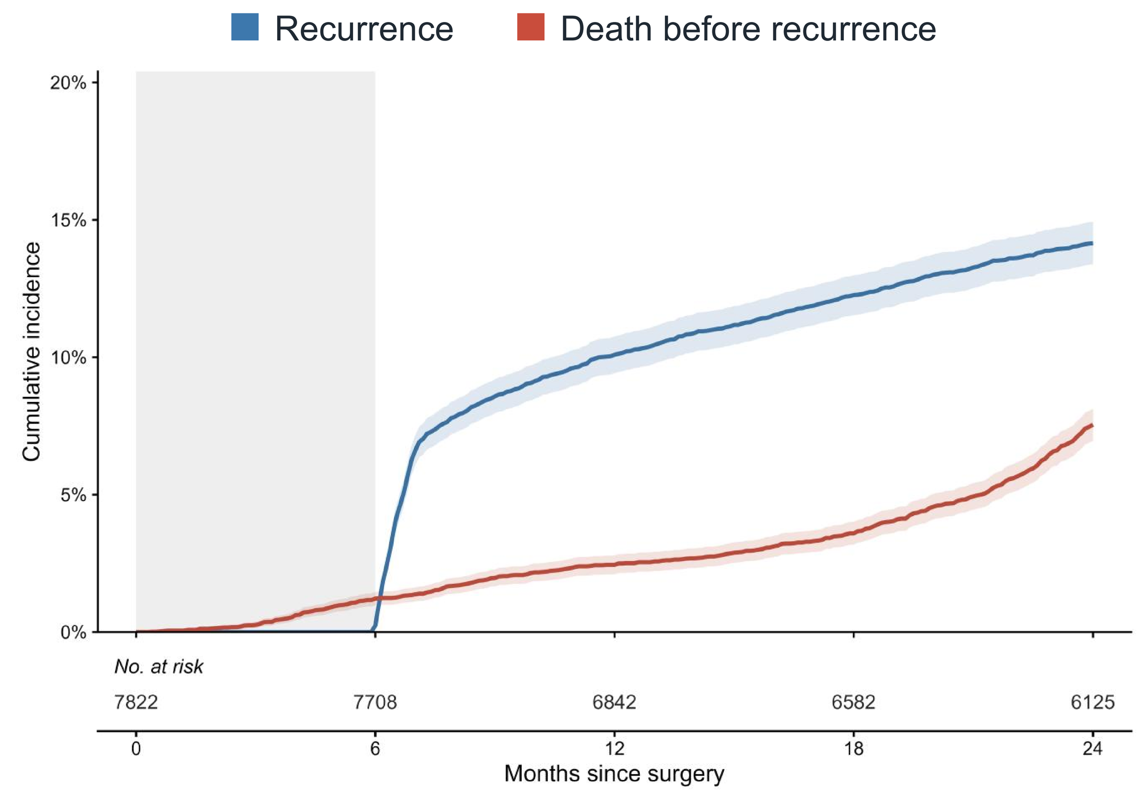
## RECURRENCE BURDEN

- **Ascertainment:** recurrence was first identified through a metastatic diagnosis code in 162 patients (13.9%) and a treatment record in 1,004 (86.1%), most often systemic anticancer therapy (696, 59.7%).
- **Incidence rate:** 7.52 recurrences per 100 person-years (95% CI 7.09–7.96).
- **Cumulative incidence:** recurrence 10.1% at 12 months and 14.2% at 24 months; death before recurrence 2.4% and 7.5%.

**14.2%** cumulative incidence of recurrence at 24 months

**7.5%** cumulative incidence of death before recurrence at 24 months

**Figure 3. Recurrence and death before recurrence (n = 7,822)**




Shaded area: 6-month blackout period, during which recurrence was not ascertained; numbers below the plot are patients at risk.

**Table 1. Recurrence burden by baseline characteristics**

| Characteristic | Patients, n (%) | Recurrence, n (%) | Rate per 100 PY | 24-month CIF, % |
|---|---|---|---|---|
| **Overall** | **7,822** | **1,166 (14.9)** | **7.52** | **14.2** |
| Age 18–44 | 1,027 (13.1) | 54 (5.3) | 2.53 | **5.3** |
| Age 45–64 | 3,131 (40.0) | 430 (13.7) | 6.80 | **13.0** |
| Age ≥65 | 3,664 (46.8) | 682 (18.6) | 9.67 | **17.7** |
| Male | 3,496 (44.7) | 659 (18.9) | 9.94 | **17.8** |
| Female | 4,326 (55.3) | 507 (11.7) | 5.71 | **11.2** |
| UEBMI | 7,156 (91.5) | 1,053 (14.7) | 7.41 | **14.0** |
| URRBMI | 666 (8.5) | 113 (17.0) | 8.74 | **16.2** |
| CCI 0 | 6,244 (79.8) | 824 (13.2) | 6.57 | **12.4** |
| CCI 1 | 1,095 (14.0) | 220 (20.1) | 10.50 | **19.4** |
| CCI ≥2 | 483 (6.2) | 122 (25.3) | 14.09 | **24.8** |

Age in years. Patients: percentage of the full cohort; Recurrence: percentage within the category. Rate: recurrence incidence rate per 100 person-years (PY). CCI, non-cancer Charlson Comorbidity Index; CI, confidence interval; CIF, cumulative incidence function.

## FACTORS ASSOCIATED WITH RECURRENCE

Older age, male sex, and higher non-cancer comorbidity were associated with recurrence in the multivariable Fine–Gray model; insurance scheme was not associated after adjustment.

| Baseline factor | SHR (95% CI) | P value |
|---|---|---|
| Age, per 10-year increase | **1.34 (1.27–1.41)** | <0.001 |
| Male sex vs female | **1.46 (1.30–1.65)** | <0.001 |
| UEBMI vs URRBMI | 1.00 (0.82–1.22) | 0.980 |
| Non-cancer CCI 1 vs 0 | **1.32 (1.14–1.54)** | <0.001 |
| Non-cancer CCI ≥2 vs 0 | **1.59 (1.31–1.94)** | <0.001 |

Death before recurrence was the competing event; the model was adjusted for all listed covariates. CCI, Charlson Comorbidity Index; CI, confidence interval; SHR, subdistribution hazard ratio.

## SENSITIVITY ANALYSES

- **Complementary cause-specific Cox models** showed associations in the same direction as the primary Fine–Gray model.
- **Categorical age:** SHRs vs 18–44 years were 2.43 (95% CI 1.83–3.23) for 45–64 years and 3.16 (2.38–4.18) for ≥65 years.
- **Blackout period:** the direction and approximate magnitude of associations were similar across definitions, but the absolute 24-month estimate was sensitive to the blackout length:

| Blackout period | 3 months | 6 months (primary) | 9 months |
|---|---|---|---|
| 24-month CIF | 21.7% | **14.2%** | 12.0% |

## IMPLICATIONS

- Claims supported population-level estimation of postoperative recurrence and competing mortality without a purpose-built follow-up system, and the estimates can be updated as later surgical cohorts complete follow-up.
- Recurrence accumulated mainly in the first two years after surgery and was more frequent among older patients, men, and patients with comorbidity, indicating the period and groups for which surveillance capacity is most likely to be required.
- Covariate associations held across every alternative definition examined, but the absolute 24-month estimate moved between 12.0% and 21.7% with the blackout period alone; an agreed ascertainment definition is needed before estimates are compared across databases.
- Linkage with cancer registry, pathology, and vital statistics would improve recurrence ascertainment and death classification.

**Conclusion: basic medical insurance claims can yield population-level estimates of recurrence and competing mortality after lung cancer surgery; validation against clinical records and registry linkage are the next steps.**

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