



# Incidence trends in oesophageal cancer by histological type: An updated analysis in Sweden



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## ABSTRACT

**Background:** We aimed to update incidence trends of oesophageal cancer by histological type in Sweden. **Methods:** Using data from the Swedish Cancer Registry, we examined incidence trends of oesophageal cancer by histological types in individuals aged  $\geq 50$  years in 1970–2014 using log-linear joinpoint regressions.

**Results:** The age-standardised incidence rate of oesophageal adenocarcinoma in men increased on average by 3.0% per year in 1970–1994, followed by a more rapid increase of 13.7% per year in 1994–2000, and a slower increase of 2.6% per year in 2010–2014. The rate of oesophageal adenocarcinoma in women increased on average by 4.2% per year during the entire period. The rate of squamous cell carcinoma generally decreased over the past 2–3 decades in both sexes.

**Conclusions:** The incidence of oesophageal adenocarcinoma continues to rise in Sweden, although the increase seems to have slowed down in men since 2000. The incidence of oesophageal squamous cell carcinoma is decreasing.

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## 1. Background

Over the past few decades, the incidence of oesophageal cancer has substantially changed in Western populations, with marked differences between the two main histological subtypes, squamous cell carcinoma and adenocarcinoma. A rapid increase in the incidence of oesophageal adenocarcinoma has been noted in Europe, North America and Australia since the 1970s, while the incidence of oesophageal squamous cell carcinoma has steadily decreased in these populations [1–3]. Earlier reports have suggested that the incidence of oesophageal adenocarcinoma might have reached a plateau in recent years [4,5], while some other studies have found a continued increase without any signs of slowing down [6,7]. The temporal trends in the incidence of oesophageal adenocarcinoma in the Western world have not been updated since the year 2010.

Using updated data from the nationwide complete Swedish Cancer Registry, we assessed the time trends in the incidence of oesophageal cancer by histological type in individuals aged 50 years or older in Sweden between 1970 and 2014. We performed joinpoint regression to identify potential change points of the trends over this calendar period and to estimate the magnitude of the trends in each time segment.

## 2. Materials and methods

### 2.1. Data source

We extracted age- and sex-specific data on all new cases of oesophageal cancer (International Classification of Diseases, 7th edition [ICD-7] code: 150) diagnosed in Sweden between 1st January 1970 and 31st December 2014 from the Swedish Cancer Registry by year of diagnosis and histological type. The Swedish Cancer Registry has a 98% nationwide coverage of oesophageal cancer and 96% coverage of all cancers [8,9]. We used well-established histology codes (WHO/HS/CANC/24.1) to define adenocarcinoma (code 096) and squamous cell carcinoma (code 146), and we included only these histological types in the study. Age- and sex-specific population data by calendar year were

Abbreviations: CI, confidence interval.

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retrieved from the Registry of the Total Population in Sweden, which has a 100% nationwide coverage.

## 2.2. Statistical analysis

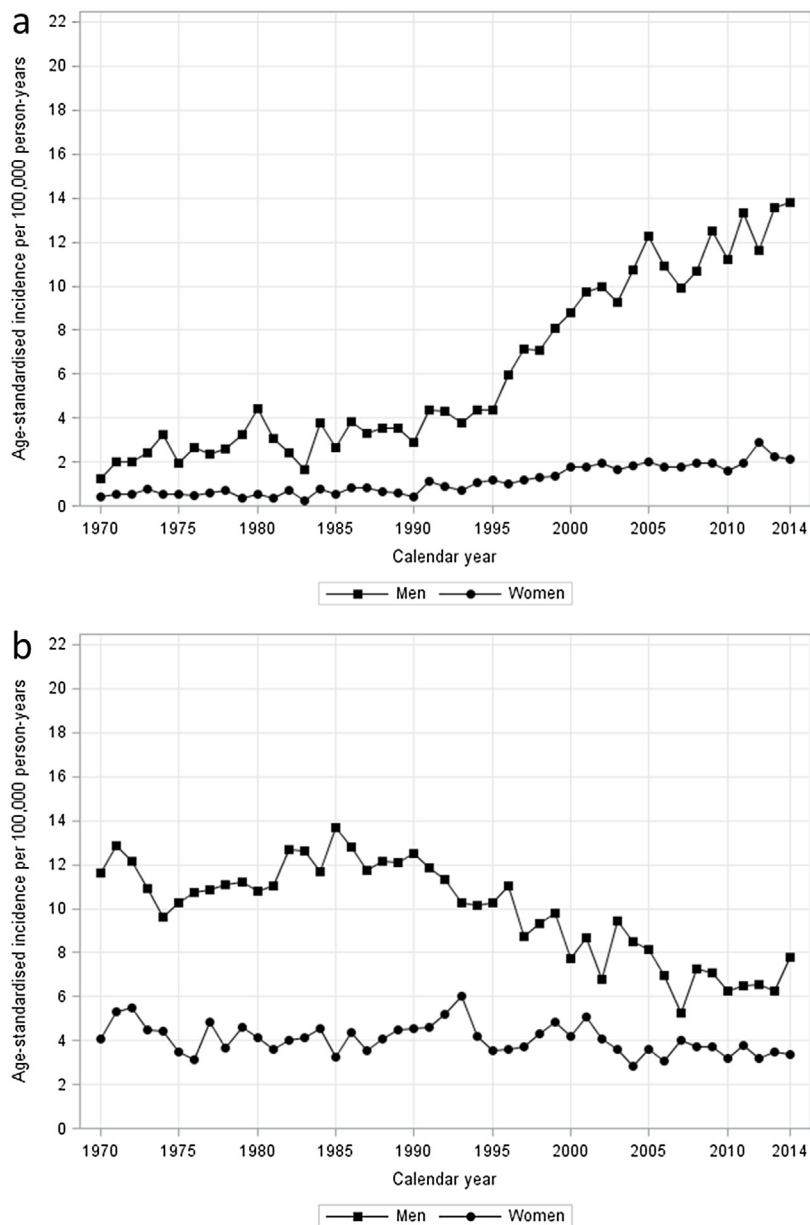
The annual age-standardised incidence rates were calculated by sex and histological type using the direct method with the age distribution (in 5-year age groups) of the Swedish population in the year 1989 as reference. Given the small number of oesophageal cancer patients who were diagnosed at an age below 50 years ( $n=207$  and  $274$ , 4.2% and 3.1% of all cases of oesophageal adenocarcinoma and squamous cell carcinoma, respectively, during the entire observation period), we calculated the incidence rates only among individuals aged 50 years or older. Log-linear joinpoint regression models were used to identify change points of the incidence trend over time and estimate the annual percent change in each time segment. The joinpoint regression was used on the assumption that the rate changes at a constant percentage

every year on a log scale in each time segment. A maximum of 4 change points were pre-defined in the joinpoint regressions. We further stratified the analysis into individuals aged 50–69 years and those aged 70 years or older. All statistical analyses were performed using the statistical software SAS version 9.4 (SAS Institute, Cary, NC), except for the joinpoint regression which was performed with the Joinpoint Regression Program version 4.3.1.0 (Statistical Methodology and Applications Branch, Surveillance Research Program, National Cancer Institute, the United States).

## 3. Results

### 3.1. Patients

Between 1970 and 2014, there were 4735 patients who were diagnosed with oesophageal adenocarcinoma (3852 [81%] men and 883 [19%] women) and 8628 patients (5718 [66%] men and



**Fig. 1.** Annual age-standardised incidence rates of oesophageal adenocarcinoma (a) and squamous cell carcinoma (b) by sex in individuals aged 50 years or older in Sweden, 1970–2014.

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