June 2000 (Volume 41, Number 2)

Cyclic Patterns of Incidence Variations for Stomach Cancer in the North-Western Region of England

Borislav D. Dimitrov
Department of Social Medicine, Higher Medical Institute, Plovdiv, Bulgaria

Aim. To analyze temporal dynamics and model trends and variations of the annual incidence rates of stomach cancer in the North-Western Region of England.
Methods. The data consisted of 23,465 new cases of stomach cancer as provided by the population-based registry of the Centre for Cancer Epidemiology (Manchester, England, UK). The parameter studied was the annual incidence rate of stomach cancer per 100,000 persons as age-adjusted to the world standard population and presented as time-series over the interval from 1971 to 1990. The hypotheses to be tested, regarding the annual incidence rates, were: 1) existence of specific temporal characteristics; 2) appearance of cyclic patterns of variability; and 3) usefulness of cyclicity in predictive modeling.
Results. The decreasing tendency of annual incidence rates of stomach cancer for both men and women was best fitted by a quadratic trend ($y=a+b\times t^2$) out of 13 available linear/nonlinear regression models. This trend explained only about 49% of variability. Cyclic patterns of variability in incidence rates were established (short-term cycle of 8.9 years; long-term hypercycle of about 22-23 years). The best fit to the real incidence rates was achieved by bi-cyclic regression model. The summary cosine-sine model contained both cycles of 8.875 and 22-23 years; it showed the least variance of regression (men – $S_y^2=1.09$; women – $S_y^2=0.65$) and best prognostic index (PI=1.47 for men, and PI=1.29 for women). This trigonometric model explained about 83-86% of variability of incidence rates of stomach cancer.
Conclusion. Cyclic patterns of variability of the annual incidence rates of stomach cancer have been established. Such cyclicity might not only find likely implications in predictive modeling and forecasting of incidence rates, but it could also be considered useful in research on risk/prevention factors for stomach cancer.

Key words: *cyclicity; England; incidence studies; models, statistical; periodicity; probabilistic models; stomach neoplasms*