

**PERFORMANCE OF HYPOTHESIS TESTS FOR GOMPERTZ
DISTRIBUTION WITH RIGHT AND INTERVAL CENSORED DATA**
(Prestasi Ujian Hipotesis bagi Taburan Gompertz dengan Data Tertapis Kanan dan Selang)

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ABSTRACT

This study compared the performance of two hypothesis tests for the parameters of the Gompertz distribution in the presence of a covariate, right and interval censored data. Firstly, the performance of maximum likelihood estimation (with and without midpoint imputation) was assessed for this model at various censoring proportion (cp), sample sizes (n) and study periods (k) by computing the values of bias, standard error (SE) and root mean square error ($RMSE$) via simulation study. Following that, the power analysis was conducted to evaluate the performance of the Wald and Likelihood ratio (LR) test for the parameters of this model at various cp , n , k and effect sizes. The results indicated that the maximum likelihood estimates obtained via midpoint imputation performed better than the ones obtained without imputation. The results of the power analysis showed that the LR test performed better for parameter β_1 whereas the Wald test performed better for parameter γ . Finally, the model was fit to the real survival data of 94 patients with breast cancer, whose lifetimes were either right or interval-censored. The covariate this study was the treatment type which were radiation therapy alone or the combination of radiation with chemotherapy.

Keywords: Gompertz; covariate; interval censored

ABSTRAK

Kajian ini membandingkan prestasi dua ujian hipotesis untuk parameter taburan Gompertz dengan adanya kovariat, data tertapis kanan dan selang. Pertama, prestasi penganggaran kebolehjadian maksimum (dengan dan tanpa imputasi titik tengah) dinilai untuk model ini pada pelbagai perkadaran penapisan (cp), saiz sampel (n) dan tempoh kajian (k) dengan mengira nilai bias, ralat piawai (SE) dan punca min kuasa dua ralat ($RMSE$) melalui kajian simulasi. Berikutan itu, analisis kuasa dikendalikan untuk menilai prestasi ujian Wald and Likelihood ratio (LR) untuk parameter model ini pada pelbagai ukuran cp , n , k dan saiz kesan. Hasilnya menunjukkan bahawa penganggaran kebolehjadian maksimum yang diperolehi melalui imputasi titik tengah berprestasi lebih baik daripada yang diperolehi tanpa imputasi. Hasil analisis kuasa menunjukkan bahawa ujian LR menunjukkan prestasi yang lebih baik untuk parameter β_1 sedangkan ujian Wald menunjukkan prestasi yang lebih baik untuk parameter γ . Akhirnya, model ini dipadankan kepada data mandirian sebenar 94 pesakit dengan barah payudara, dengan jangka hayat mereka sama ada ditapis kanan atau ditapis selang. Kovariat kajian ini ialah jenis rawatan iaitu terapi sinaran sahaja atau gabungan sinaran dengan kemoterapi.

Kata kunci: Gompertz; covariate; right-censored; interval censored; midpoint

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