

## ABSTRACT

### PARAMETER ESTIMATION OF NEGATIVE BINOMIAL REGRESSION (NBR) AND GENERALIZED POISSON REGRESSION (GPR) MODELS USING THE MAXIMUM LIKELIHOOD ESTIMATION (MLE) METHOD (A CASE STUDY OF THE NUMBER MATERNAL DEATHS IN THE REGENCIES AND CITIES OF LAMPUNG PROVINCE)

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Poisson regression is a non linear regression that models a response variable in the form of discrete data based on the Poisson distribution which assumes that the mean of the response variable is equal to its variance or is called the equidispersion condition. However, the overdispersion condition where the variance is greater than the mean of the response variable is often found in Poisson regression analysis. As a result, the standard error of estimation becomes too small so that a predictor variable appears significant when in fact it is not significant. Alternative models that can be used to overcome the overdispersion problem are the Negative Binomial Regression (NBR) and Generalized Poisson Regression (GPR) models. This study discusses the application of the NBR and GPR models to maternal mortality data in the regencies/cities of Lampung Province in 2024. Parameter estimation was carried out using the Maximum Likelihood Estimation (MLE) method with the aid of Newton-Raphson and Fisher Scoring iterations to obtain the parameter estimates of the models. Furthermore, the best model was selected based on the smallest Akaike Information Criterion (AIC) value. The results showed that the NBR model was the best model with an AIC value of 86.1 smaller than the Poisson regression and GPR models at the 5% significance level, the factors that significantly affected the number of maternal deaths were the School Participation Rate (SPR) in the 19–24 age group ( $X_1$ ), the percentage of ever-married women aged 15–49 years who obtained modern family planning devices at community health centers ( $X_2$ ) and the percentage of the sixth visit (K6) of pregnant women ( $X_3$ ).

**Keywords:** Overdispersion, NBR, GPR, Maximum Likelihood Estimation (MLE), Number of maternal deaths.

## ABSTRAK

**PENDUGAAN PARAMETER MODEL *NEGATIVE BINOMIAL REGRESSION* (NBR) DAN *GENERALIZED POISSON REGRESSION* (GPR) DENGAN METODE *MAXIMUM LIKELIHOOD ESTIMATION* (MLE)  
(STUDI KASUS : JUMLAH KEMATIAN IBU  
DI KABUPATEN/KOTA DI PROVINSI LAMPUNG)**

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*Poisson regression* merupakan regresi non linear yang memodelkan variabel respon berbentuk data diskrit berdasarkan distribusi Poisson yang mengasumsikan bahwa nilai rata-rata variabel respon sama dengan variansnya atau disebut kondisi equidispersi. Namun, kondisi overdispersi dimana nilai varians lebih besar dibandingkan nilai rata-rata variabel respon sering ditemukan dalam analisis *Poisson regression*. Akibatnya, kesalahan standar pendugaan menjadi terlalu kecil sehingga suatu variabel prediktor terlihat signifikan padahal sebenarnya tidak signifikan. Model alternatif yang digunakan untuk mengatasi masalah overdispersi adalah model *Negative Binomial Regression* (NBR) dan *Generalized Poisson Regression* (GPR). Penelitian ini membahas penerapan model NBR dan GPR pada data jumlah kematian ibu di kabupaten/kota di Provinsi Lampung tahun 2024. Pendugaan parameter dilakukan menggunakan metode *Maximum Likelihood Estimation* (MLE) dengan bantuan iterasi Newton-Raphson dan iterasi *Fisher Scoring* untuk memperoleh nilai dugaan parameter model. Selanjutnya, dipilih model terbaik berdasarkan nilai *Akaike Information Criterion* (AIC) terkecil. Hasil penelitian menunjukkan bahwa model NBR merupakan model terbaik dengan nilai AIC sebesar 86,1 lebih kecil dibandingkan model *Poisson regression* dan GPR pada taraf signifikansi 5%, faktor-faktor yang berpengaruh signifikan terhadap jumlah kematian ibu adalah Angka Partisipasi Sekolah (APS) pada kelompok umur 19–24 tahun ( $X_1$ ), persentase perempuan pernah kawin berumur 15–49 tahun yang memperoleh alat KB modern di puskesmas ( $X_2$ ) dan persentase kunjungan ke-6 (K6) ibu hamil ( $X_3$ ).

**Kata kunci:** Overdispersi, NBR, GPR, *Maximum Likelihood Estimation* (MLE), Jumlah kematian ibu.