ABSTRAK

Rifka Annaria Sibuea, NIM 4213530009 (2026). Model Matematika terhadap Dinamika Kriminalitas di Provinsi Sumatera Utara.

Kriminalitas merupakan permasalahan sosial yang dapat memengaruhi stabilitas sosial, ekonomi, serta keamanan masyarakat. Faktor-faktor seperti pendidikan, interaksi sosial, dan kondisi ekonomi memiliki peran penting dalam penyebaran kriminal. Penelitian ini bertujuan untuk menganalisis model matematika dinamika kriminalitas di Provinsi Sumatera Utara yang dibagi kedalam lima sub populasi, yaitu SC_1C_2PR (*Susceptible, Criminal Suspect, Criminal Defendant, Prison, Recovered*) dengan mempertimbangkan pengaruh program edukasi. Analisis yang dilakukan berupa menentukan titik kesetimbangan, menghitung bilangan reproduksi dasar (R_0), serta analisis kestabilan menggunakan metode linierisasi dan kriteria Routh-Hurwitz. Berdasarkan hasil analisis, diperoleh bilangan reproduksi dasar $R_0 > 1$, sehingga model memiliki dua titik kesetimbangan, yaitu titik kesetimbangan bebas kriminal yang tidak stabil dan titik kesetimbangan adanya kriminal yang stabil asimtotik lokal. Kondisi ini merepresentasikan bahwa satu pelaku kriminal dapat memunculkan lebih dari satu individu kriminal baru, sehingga aktivitas kriminal akan bertahan dan menyebar dalam masyarakat hingga mencapai kondisi adanya kriminal yang stabil. Hasil simulasi menunjukkan bahwa program edukasi yang efektif dan merata mampu menekan angka dinamika kriminalitas, namun belum cukup untuk mencapai kondisi bebas kriminal tanpa peran pembatasan interaksi sosial, sehingga dibutuhkan program lain dalam menurunkan angka kriminalitas di Sumatera Utara.

Kata kunci: Kriminalitas, model SC_1C_2PR, efektivitas edukasi, analisis kestabilan.

ABSTRACT

Rifka Annaria Sibuea, NIM 4213530009 (2026). Mathematical Model on the Dynamics of Criminality in North Sumatra Province.

Crime is a social problem that can affect social stability, the economy, and public safety. Factors such as education, social interaction, and economic conditions play an important role in the spread of crime. This study aims to analyze a mathematical model of crime dynamics in North Sumatra Province, which is divided into five sub-populations, namely SC_1C_2PR (Susceptible, Criminal Suspect, Criminal Defendant, Prison, Recovered), taking into account the influence of education programs. The analysis conducted involves determining the equilibrium point, calculating the basic reproduction number (R_0), and analyzing stability using the linearization method and the Routh-Hurwitz criterion. Based on the analysis results, the basic reproduction number $R_0 > 1$ was obtained, so that the model had two equilibrium points, namely an unstable crime-free equilibrium point and a locally asymptotically stable equilibrium point with crime. This condition represents that one criminal can give rise to more than one new criminal individual, so that criminal activity will persist and spread in society until it reaches a stable state of crime. The simulation results show that effective and equitable education programs can reduce crime rates, but they are not sufficient to achieve a crime-free environment without restricting social interaction. Therefore, other programs are needed to reduce crime rates in North Sumatra.

Keywords: Criminality, SC_1C_2PR model, education efficacy, stability analysis.