

Model Matematika Penyebaran HIV/AIDS dengan Edukasi Kesehatan

Marsudi ^{1)*}, Ratno Bagus Edy Wibowo¹⁾

¹⁾ Jurusan Matematika, Fakultas MIPA, Universitas Brawijaya, Malang 65145

Diterima 21 Februari 2013, direvisi 5 April 2013

ABSTRAK

Dalam penelitian ini telah dilakukan analisis kestabilan penyebaran HIV/AIDS dengan edukasi kesehatan melalui perluasan model *SI* (*susceptible-infected*). Dalam pemodelan epidemik HIV/AIDS, populasi dibagi menjadi enam subpopulasi: *susceptible* tanpa edukasi, *susceptible* dengan edukasi, *infected* tanpa edukasi tanpa simptom AIDS, *infected* tanpa edukasi dengan simptom AIDS, *infected* dengan edukasi dan tanpa simptom AIDS dan *infected* dengan edukasi dan simptom AIDS. Titik kesetimbangan bebas penyakit model adalah stabil asimptotik lokal jika angka reproduksi efektif lebih kecil satu dan tidak stabil jika angka reproduksi efektif lebih besar satu. Titik kesetimbangan endemik ada jika angka reproduksi efektif lebih besar satu dan kestabilannya ditentukan menggunakan teori manifold pusat. Teori manifold pusat dapat digunakan untuk menganalisis kestabilan dekat titik kesetimbangan bebas penyakit (angka reproduksi efektif sama dengan satu). Dampak edukasi kesehatan pada penyebaran HIV/AIDS dikaji dengan analisis sensitivitas angka reproduksi efektif terhadap semua parameter yang mendorong dinamika penyakit.

Kata kunci: HIV/AIDS, angka reproduksi efektif, analisis kestabilan dan sensitivitas.

ABSTRACT

In this research has been carried out the stability analysis of HIV/AIDS epidemic model with a public health educational through the expansion of the *SI* (*susceptible-infected*) model. In modeling of HIV/AIDS epidemic, the population is divided into six subpopulations: uneducated susceptible individuals, educated susceptibles individuals, uneducated infected individuals without AIDS symptoms, educated infected individuals with AIDS symptoms, uneducated infected individuals with AIDS symptoms and educated infected individuals with AIDS symptoms. The disease free equilibrium point of the HIV transmission model with education program is locally asymptotically stable if the basic reproduction number is less than unity and unstable if the basic reproduction number is greater than unity. The endemic equilibrium point is exist if the effective reproduction number is greater than unity and stability of endemic equilibrium point has been determined using the Center manifold theory. The center manifold theory can be used to analyze the stability near the disease free equilibrium point (the effective reproduction number is equal to unity). The impact of a public health education on the spread of HIV/AIDS, the sensitivity analysis on effective reproduction numbers respect to all the parameters which drive the disease dynamics.

Key word: HIV/AIDS, effective reproductive number, stability and sensitivity analysis.

DAFTAR PUSTAKA

- [1] Anonim (2010), *Strategi Nasional Penanggulangan HIV dan AIDS 2010-2014*, Komisi Penanggulangan AIDS Nasional.
- [2] Hussaini, N., Winter, M. and Gumel, A.B. (2011), Qualitative Assesment of The Role of Public Health Education Program on HIV Transmission Dynamics, *Mathematical Medicine and Biology* , Vol. 28 No.3, pp. 245–270.
- [3] Mukandavire, Z., Garira, W. and Tchuenche, J.M. (2009), Modelling Effects of Public Health Educational Campaigns on HIV/AIDS Transmission Dynamics, *Applied Mathematical Modelling*, Vol. 33, No. 4, pp. 2084–2095.
- [4] Marsudi dan Wibowo, R.B.E. (2012), *Analisis Kualitatif Dampak Program Kampanye Edukasi Kesehatan Masyarakat pada Dinamika Penyebaran HIV*, Laporan Penelitian Unggulan-Fundamental 2012, Lemlit UB
- [5] Chitnis, N., Hyman, J.M. and Cushing, J.M. (2008), *Determining Important Parameter in the Spread of Malaria Through the Sensitivity Analysis of Mathematical Model*, Department of Public Health and Epidemiology, Vol. 70, pp. 1272-1296.
- [6] van den Driessche, P. and J. Watmough, J. (2002), Reproduction Numbers and Sub-threshold Endemic Equilibria for Compartmental Models of DiseaseTransmission, *Mathematical Biosciences*, 180, 29–48.
- [7] Chavez-Castillo and Song, B. (2004), Dynamical Models of Tuberculosis and their Applications, *Mathematical Bioscience and Engineering*, Vol. 1, No. 2, pp. 361-404.