

Analisis Dinamik Model Interaksi Perokok Konvensional dan Perokok Elektrik = Dynamical Analysis of Interaction Model Between Conventional and Electronic Cigarette Smokers

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Abstrak

Pada artikel ini dikonstruksi model interaksi antara perokok potensial, perokok konvensional, perokok elektrik, perokok yang berhenti merokok sementara dan perokok yang berhenti permanen. Model yang dibentuk menggunakan sistem persamaan diferensial biasa orde satu. Analisis yang dilakukan antara lain adalah eksistensi dan kestabilan titik keseimbangan dan basic reproduction number. Kestabilan titik kesetimbangan bebas rokok stabil asimtotik lokal ketika basic reproduction number < 1 dan tidak stabil ketika basic reproduction number > 1 dan memunculkan titik kesetimbangan endemic rokok. Artinya, kasus kebiasaan merokok dapat dikontrol atau dihilangkan secara efektif jika basic reproduction number < 1 . Tetapi jika basic reproduction number > 1 , kasus kebiasaan merokok akan selalu ada didalam populasi. Dilakukan analisis sensitivitas dan elastisitas serta simulasi numerik terhadap parameter yang paling berpengaruh. Lebih jauh, laju interaksi perokok potensial ke perokok konvensional maupun perokok elektrik dan laju interaksi perokok konvensional ke perokok elektrik memegang peran penting terhadap peningkatan nilai basic reproduction number. Namun, hal ini dapat diminimalkan dengan laju berhentinya perokok konvensional dan elektrik menjadi berhenti merokok sementara maupun selamanya.

.....In this article, a mathematical model of interaction between conventional smokers, electronic-cigarette smokers, temporarily smoking quitters and permanently smoking quitters is constructed. The model was formed using a system of first order ordinary differential equations. The analysis carried out includes the existence and stability of the balance point and the basic reproduction number. The stability of Smoking Free Equilibrium (SFE) is locally asymptotically stable when basic reproduction number < 1 and unstable when basic reproduction number > 1 and show Smoking Endemic Equilibrium (SEE). That is, smoking case can be controlled or eliminated effectively if basic reproduction number < 1 . But if basic reproduction number > 1 , smoking case will always be present in the population. The analysis of sensitivity and elasticity as well as numerical simulations is done on the most influential parameters. Furthermore, the interaction rate of potential smokers to conventional smokers and e-cigarette smokers as well as the interaction rate of conventional smokers to e-cigarette smokers play an important role in increasing the value of basic reproduction number. However, this can be minimized by the cessation rate of conventional and e-cigarette smokers to quit smoking temporarily or permanently.