1125-92-1039 **Zhilan Feng*** (fengz@purdue.edu), 150 N. University St., Department of Mathematics, Purdue University, West Lafayette, IN 47907, and **Andrew N Hill**, **Aaron T Curns** and **John W Glasser**. *Using the partial derivatives of effective reproduction numbers to guide public health policy.*

Because the average number of secondary infections per infectious primary, Re, must exceed one for an outbreak, health authorities endeavor to reduce Re >1. Depending on one's model, it may be possible to derive an explicit expression for Re via the next-generation matrix approach. If so, one can take its partial derivatives with respect to control parameters. If not, one can determine their respective effects numerically. These results describe not only alternative routes by which policymaking goals might be attained, but magnitudes of their respective effects and potential for effect modification. In meta-population models, the corresponding multivariate partial derivative is the gradient, a vector-valued function. Using an SEIR model of pandemic influenza with 7 age groups, 51 spatial strata (states plus the District of Columbia) and a suitable two-level mixing function, we use the gradient to compare optimal and actual vaccination during the 2009-10 influenza pandemic in the United States. We also show that vaccination efforts could have been adjusted month-to-month during the fall of 2009 to ensure maximum impact. Together with colleagues at the China CDC, we are using this model to identify the optimal strategies for eliminating measles and controlling rubella in China. (Received September 14, 2016)