Backward bifurcations
MATH 8xyz – Lecture 13

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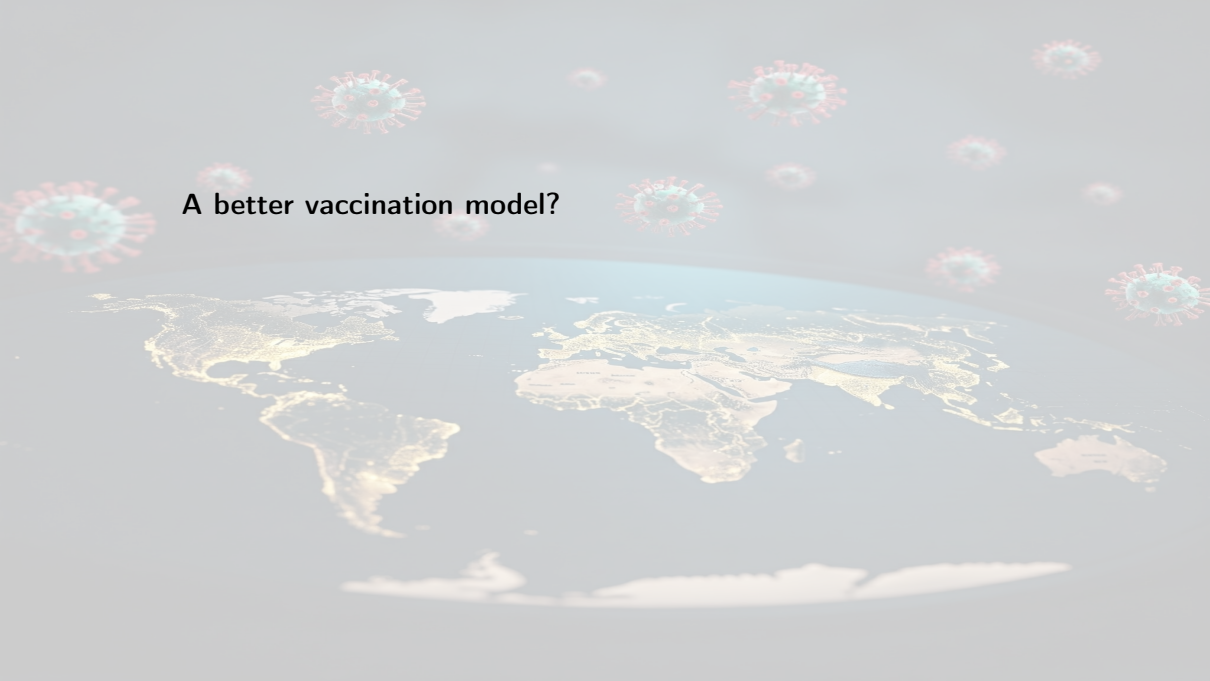julien.arino@umanitoba.ca

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Outline

A better vaccination model?

GLOBAL RESULTS FOR AN EPIDEMIC MODEL WITH VACCINATION THAT EXHIBITS BACKWARD BIFURCATION[*]

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Abstract. Vaccination of both newborns and susceptibles is included in a transmission model for a disease that confers immunity. The interplay of the vaccination strategy together with the vaccine efficacy and waning is studied. In particular, it is shown that a backward bifurcation leading to bistability can occur. Under mild parameter constraints, compound matrices are used to show that each orbit limits to an equilibrium. In the case of bistability, this global result requires a novel approach since there is no compact absorbing set.

Key words. epidemic model, vaccination, backward bifurcation, compound matrices, global dynamics
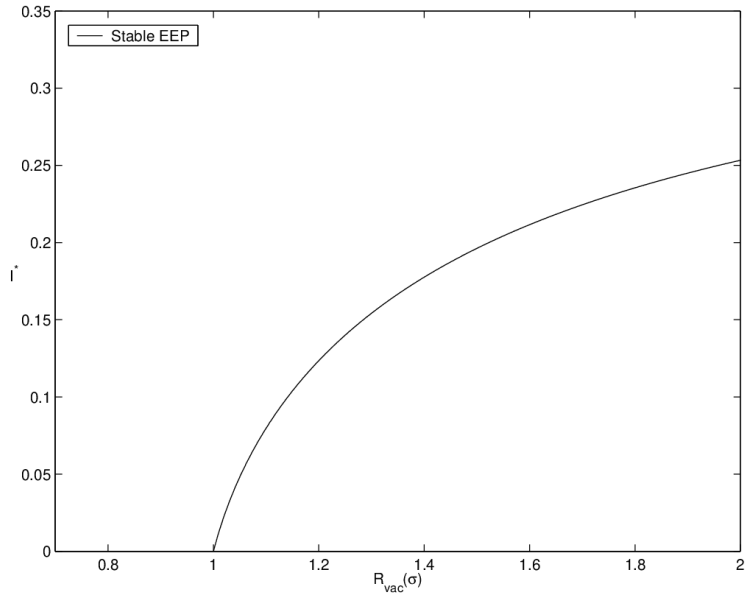
AMS subject classifications. 92D30, 34D23

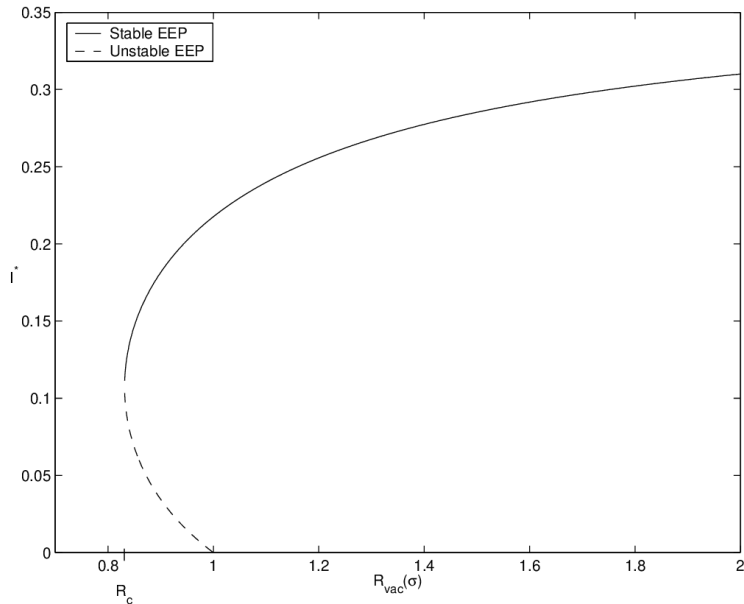**DOI.** 10.1137/S0036139902413829

SLIRS with vaccination
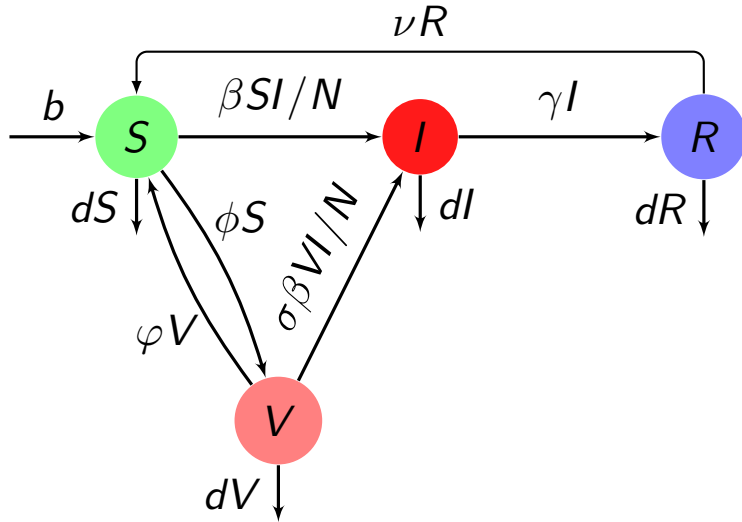
The usual situation

What can happen with vaccination – Backward bifurcation

Bibliography I

J. Arino, C.C. McCluskey, and P. van den Driessche. Global results for an epidemic model with vaccination that exhibits backward bifurcation. *SIAM J Appl Math,* 64(1):260–276, 2003.