

1046-34-933

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*Modeling HIV outbreaks: The Male to Female Prevalence Ratio in the Core Population.*

This is joint work with Brandy Rapatski. What affects the ratio of infected men to infected women in the core population in a heterosexual HIV epidemic? Hethcote & Yorke introduced the term "core" initially to loosely describe the collection of individuals having the most unprotected sex partners. We study the early epidemic during the exponential growth phase and focus on the core group since most infected people were infected by people in the core. We argue that in the early outbreak phase of an epidemic, there is an identity which we call the "outbreak equation". It relates three ratios that describe the core men versus the core women, namely, the ratio  $E$  of numbers of all core men to all core women, the ratio  $C$  of numbers of infected core men to core women, and the ratio  $M$  of the infectiousness of a typical core man to that of a typical core woman. Then the relationship between the ratios is  $E = MC^2$  in the early outbreak phase. We investigate two very different scenarios, one in which there are two times as many core men as core women ( $E = 2$ ) and the other in which core men equal core women ( $E = 1$ ). In the first case, the HIV epidemic grows at a much faster rate. (Received September 12, 2008)