



Name: _____

Problem solving I: Controlling influenza: Calculate the fraction of influenza transmission before detectable symptoms

We want to calculate how much we could reduce transmission potential, R_0 , by quarantining sick people. Data from an experimental infection study of a strain of influenza (yup, people volunteered to get the flu!) are shown in the figure. The blue bars show the amount of viral shedding, which is strongly correlated with infectiousness. Fraser et al's 2004

PNAS paper (Fig 1) showed that R_0 for a pathogen is *proportional to* the area under the infectiousness curve (i.e. the sum of daily infectiousness values). The line shows the fraction of people with fever on that day.

- 1) If we were able to quarantine people as soon as they have fevers, how much (what fraction or percent) could we reduce R_0 ? You will need to make some calculations! Show your work! (2 pts)

- 2) If we used both quarantine of people with fever and contact tracing and assumed they were 100% effective, would we be able to control this disease, assuming the variance of transmission rate, β , and incubation period, S , parameters were low? Assume the actual value of R_0 for this strain of influenza in the population we are interested in is 6. (Hint: you will need to use a figure in the Fraser et al 2004 PNAS paper to answer this question). Explain your answer by re-drawing the figure you need (just the axes and the line that separates outbreak controlled from insufficient control) and put a point where you think this strain of influenza is on the figure. (2 pts)