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 below. The blue line shows the amount of viral shedding, which is strongly correlated with infectiousness. Fraser et al's 2004 PNAS paper showed that R_0 for a pathogen is *proportional to* the area under the infectiousness curve. The orange line is an overall symptom score, and the grey line shows the fraction of people with fever.

1) If we were able to quarantine people once they had a fever, how much could we reduce R_0? You will need to make some calculations and use a figure in the paper! Show your work!

2) If we used both quarantine of people with fever and contact tracing, would we be able to control this disease, assuming the variance of transmission rate, β, and incubation period, S, parameters were low? Assume the 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.