Indecisives Anonymous
DARTH Hands-on Exercise Solutions

a) Home S. should use a cohort state-transition model model. A state-transition model would allow him to estimate his remaining quality-adjusted life-expectancy with and without the diet. Health states would include acute events like heart attack and stroke as well as chronic conditions such as diabetes, as well as the baseline utility he would experience with and without the diet. Homer's goal is to maximize his remaining quality-adjusted life-expectancy, so the outcome of interest is QALYs. The time horizon should be his entire lifetime.

b) Sister J. could likely use a decision tree, with "exposure" being the terminal node value (1 or 0). She could also use the tree to conduct a cost-effectiveness analysis. She could easily conduct a one-way sensitivity analysis on the underlying risk of exposure to tailor the precautions to the situation (level of risk), assuming she has a well-defined willingness-to-pay per exposure averted.

c) Cristina Y. should use a decision tree. Chance nodes would capture all the potential uncertain events that could occur during surgery and embedded decision nodes would allow Cristina to evaluate the best course of action should these events occur. The outcome of interest is patient survival, so the terminal nodes should be 1 if the patient survives and 0 if the patient dies. By rolling back the tree, Cristina could determine the best, full plan that maximizes the patient's probability of surviving the surgery. This is not a dynamic model, but the implicit time horizon is the duration of the surgery.

d) Tony S. should use a microsimulation model with interactions to model how STIs spread through his workers and the community. Using this model, Tony could estimate the expected number of STIs that would occur under each intervention as well as the healthcare and program costs that would be incurred over his stated time horizon of 24 months. He could then conduct a cost-effectiveness analysis to determine which strategy he should invest in for STI prevention. A compartmental model could potentially be used; however, partner-based strategies, such as contact tracing, cannot be easily represented in compartmental models because partnerships are not explicitly modeled or tracked.

e) Dr. B. should use a cohort state-transition model that simulates the occurrence of strain and recovery from strain on a daily basis. The relevant time horizon is 4 weeks (or until the EHR system can be fixed). The model should be used to estimate the impact injury prevention versus physical therapy on outcomes (productivity) and costs. Since

productivity is often estimated in monetary terms, it seems plausible that this analysis could be done to maximize net monetary benefit (productivity – costs). Alternatively, a cost-effectiveness framework could be used, though a clear and measurable unit of productivity would need to be defined along with a willingness-to-pay threshold for a one-unit gain in productivity.