Assignment 3

This assignment is done in groups of two or three, which you have chosen.

Objective: Create agent-based models that utilize data for calibration and validation.
Due date: Monday Nov 19th, 11pm. Assignments do not receive a grade after the due date.
                    ↑ *It may look far away, but this assignment takes time. Start early.*
How to submit: On the course website only (no emails or hardcopies accepted).
                    Send a ZIP with all four files, named e.g. Knight_Brickhome_Waters.zip

I. Overview
At this point in the class, you've seen how to convey an agent-based model (ABM) via the standard ODD Protocol. You have also learned the basics on how to program such models using NetLogo. To take a step further toward how modellers actually create their models, we bring in the role of data. Note that data goes both into *building a model* (e.g., to set appropriate population demographics and course of disease) and into *validating* it (i.e., comparing its predictions with facts that weren't used to build it). In this assignment, your team will develop a model using appropriate data, implement it in NetLogo, validate the model to a reasonable extend, and convey it using the ODD.

II. What we are modeling

We want to create a model that accurately replicates the dynamics of **tuberculosis** (TB) **in South Carolina**. As detailed by the Centers for Disease Control and Prevention, "TB can be spread through the air when a person with active TB coughs, sneezes, or speaks. Breathing in the bacteria can lead to infection in the lungs. Symptoms of TB in the lungs include cough, tiredness, weight loss, fever, and night sweats." TB is categorized as an **opportunistic infection** as it is more likely to occur in hosts with weakened immune systems (e.g., individuals with certain forms of cancer, individuals with AIDS or not treated for HIV, etc.).

III. Your tasks
1) **Design a model using appropriate data sources**. You have to think of all of the individual characteristics that matter, and how some may depend on others (instead of assuming that they're all independent). You also have to understand enough about how the disease functions so you can model its course appropriately. In designing your model, pay specific attention to using data. You'd need general demographics of South Carolina, tuberculosis data, data about all other diseases that can weaken the immune system, etc. Also include that people who don't (know they) have TB avoid those who are seen coughing, and those with a weakened immune system avoid them even more.

2) **Implement the model in NetLogo**. Ensure that your code is commented. Since your model takes into account adaptation and cognition of agents, refer to chapter 5 of your textbook for anything you may need beyond our latest labs. Do test thoroughly your code to avoid bugs.

3) **Examine the model quality and attempt to reasonably improve it**. Using different data than the ones used to create the model, examine whether relevant model outputs match what they should be. Most likely, the first time you run a model, it won't be a great match because we forgot some key factors. Identify what factor may be needed and modify the model accordingly. You're not asked to make *huge* changes but a reasonable guess at what to add, get data, and change the code.

IV. What to submit
• Your NetLogo file, with your final model.
• A PDF containing an ODD description of your model.
• A PDF spreadsheet of all data sources you used (Name / Date / URL / What they're used for).
• A PDF explaining how you've initially validated your model, and how you improved its quality.