

## Wealth Distribution Lab

Name \_\_\_\_\_, Section \_\_\_\_\_

### The Model

Epstein and Axtell (1996) developed a well known model of artificial society called Sugarscape. Sugarscape is an agent-based model in which Epstein and Axtell explored many social phenomenon as a complex system looking for emergent behavior. The wealth distribution lab uses a Netlogo model that implements one part of Sugarscape. In the Netlogo version agents survive on grain, not sugar.

Each agent has a randomly determined set of characteristics: vision, metabolism, minimum life expectancy, and maximum life expectancy. Thus all agents differ except that they all start with roughly equal wealth distribution (amount of grain held). In a given period, agents are selected in random order to look around their immediate vicinity for the plot of land with the most grain available (and not occupied by another agent). How far they can see is based on their specific vision. They move to that piece of land, acquire the grain located there. They also have to consume grain equal to their specific metabolism. When an agent's life expectancy runs out or they run out of grain they die. Each agent leaves a single new off-spring who has a randomly determined vision, metabolism. The off-spring also receives a randomly determined amount of wealth (picked by adding a random amount between 0 and 50 to their metabolism; note this is based on what the code does and is different than what the information tab in the model says). There is no inheritance.

### Lab Exercise

1. Go to <http://mcbridme.sba.muohio.edu/ace/labs/>
2. Click on the “WealthDist” link to call up the information page on the model.
3. You can run the model in your browser by click on the link or if you’ve downloaded NetLogo, you can run the model from the included NetLogo models library (File Menu: Models Library, then choose Social Science/Wealth Distribution) and run it from the desktop.
4. The controls in the model are:
  - *Setup Button*: Generates an initial random setup of the model. If you want to restart the simulation with a new random setup, make sure the simulation is not running before pressing the button.
  - *Go Button*: Starts the simulation running. Pressing “Go” a second time stops the simulation from running.
  - *Sliders*: Sliders for setting each of the parameters (max vision, max metabolism, etc.) in the model. Initially leave the sliders set at their defaults.
5. Play with the model. Press Setup and watch what happens. Stop the model, adjust the parameters, and run the model again.

### Things to Notice:

What happens to the distribution of wealth? Even though the agents start out roughly equal in wealth, do they stay equal?

Do poor families stay poor? rich stay rich? Hint: you may need to slow down the model to see observe. The agents are color coded.

Let the model run until the number in each class starts to stabilize. How long does it take?

Observe the Gini Coefficient (a measure of inequality). Does it start to stabilize over time?

**Things to Try:**

Before trying the following, quit the model, then go back so you have the original default parameter values.

How does the num-grain-grown affect the distribution of wealth?

Does life-expectancy-max affect the distribution of wealth?

Experiment with the percent-best-land and the num-people. Are there combinations that lead to more or less equality?

**Things to Consider:**

Typically this model illustrates Pareto's Law in which most people are poor, fewer are middle income, and very few are rich.

Why, given a roughly equal distribution of income, does the inequality arise?

What factors seem to be most important?

What insights can this model help you gain about the nature of wealth inequality in a society?

**Resources:**

For information on the Lorenz Curve see:

[http://en.wikipedia.org/wiki/Lorenz\\_curve](http://en.wikipedia.org/wiki/Lorenz_curve)  
a good explanation with considerable detail on how to derive the Lorenz Curve.

For information on the Gini Coefficient see:

[http://en.wikipedia.org/wiki/Gini\\_coefficient](http://en.wikipedia.org/wiki/Gini_coefficient)  
a very good explanation of the Gini Coefficient with sample data from around the world and over time for the U.S.

<http://www.wessa.net/co.wasp>  
an interesting online calculator for a variety of measures of concentration, not just the Gini Coefficient).