Undercover Bruise

New Mexico
Supercomputing Challenge
Final Report
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Team #61
Jackson Middle School

Team Members
Karina Ortega
Kelsey Theriot
Sandra LeNguyen

Teacher
Karen Glennon

Mentor
Nick Bennet
Dr. Shilpa Reddy

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Executive Summary

At first we started out with the subject Melanoma. But that subject was too broad and we had to narrow it down; therefore we looked up the different forms of melanoma and decided that we wanted to do acral lentiginous melanoma. The reason we chose to do ALM was because it was one of the most interesting, being one of the most rare and having no known etiology.

Problem Statement

The subject of our project was chosen to be acral lentiginous melanoma, because it was a skin cancer we had learned a little bit about in health class and we were interested in learning more about it. At first, our goal was to find the cause of ALM, but then we concluded that was a big goal. So we changed our goal into finding some of the factors that lead to the cancer. This way, we could start small and go on from there.

Background

Acral lentiginous melanoma is one of four different forms of melanoma skin cancer. It is one of the most rare types of skin cancer and is often referred to as a “hidden melanoma,” because the lesions (a wound or change in tissue or an organ) occur on parts of the body that are not usually examined. It is usually overlooked until it reaches a more advanced stage, since, at its early stages, often looks just like a bruise or nail streak.

This melanoma develops on the palms, soles, mucous membranes, and underneath fingernails and toenails. Some symptoms are bruises that do not fade or bruises that come and go; nails that lift up or separate from the nail bed; new nail streaks not associated with recent trauma; enlarging or very darkly pigmented nail streaks; pigmented masses in the mouth; chronic nosebleeds and nasal stuffiness.

Like any other type of disease or cancer, anyone is at risk of getting it. It is more common in Africans and Asian patients, though. It usually occurs with people in their sixth, seventh, or eighth decade of life. Sixth decade meaning when you are between the ages 50 and 59. Seventh decade meaning when you are 60-69 and eighth decade meaning when you are 70-79.

Acral lentiginous melanoma has no known etiology (origin; cause), but there are some common factors that lead to the cancer. Some of those factors are: if you have a self or family history of any cancer, if you have several moles, pregnancy, and your race. Unlike most other skin cancers, ALM (acral lentiginous melanoma) is not related to sun exposure. Since there is no known cause, there really isn’t any way to prevent yourself from getting it.

Treatment typically involves surgery; if the melanoma has spread, chemotherapy or radiation would be the next step. Biopsies would determine the depth and invasiveness of the melanoma and would define what the final treatment would be. If the melanoma were to involve the nail fold and the nail bend, complete excision of the nail unit would be required. Treatments could also require wider excisions (margins of .5 cm or more), digital amputation, lymph angiogram with lymph node dissection, or chemotherapy. (Lymphangiography, or lymph node angiogram, is a test, which utilizes a-ray technology, along with the injection of a contrast agent, to view lymphatic circulation and lymph nodes for diagnostic purposes.)

This is most of the information we have gathered to this date. (The “main” information)

Approach

Once we decided what to do our project on and what our goals were, we did research. Then, contacted a couple of doctors for more information. We organized the information into the following categories: general info, factors, probabilities (numbers), etc. The information we have gathered to this date is found in the “Background” section of this final report. We used this information to create a model that shows the following:

-ethnicity of the agents
-whether or not they have melanoma
-if the melanoma is acral lentiginous melanoma

We also put a couple of other factors and the agents have random characteristics. Some of these you cannot see in “Spaceland”.

Before we started running tests on our model, we came up with a hypothesis:

10% of all the agents (humans) would have the cancer
3% would be Asian
4% would be African
2% would be Caucasian
1% would be Hispanic
3% would die
4% would “heal”
3% would have it come back

The actual results we got from model are found under the “Results” part of our report.

Math/Algorithm

In our Starlogo TNG program we used the following factors with these probabilities:

Previous melanoma (1 out of 3 chances)
-Starlogo would roll a 3-sided “die” and if it was to land on 1 the agents would get ALM

Melanoma being ALM (5%)
5% of all the infected would have ALM meaning 95% would just have melanoma

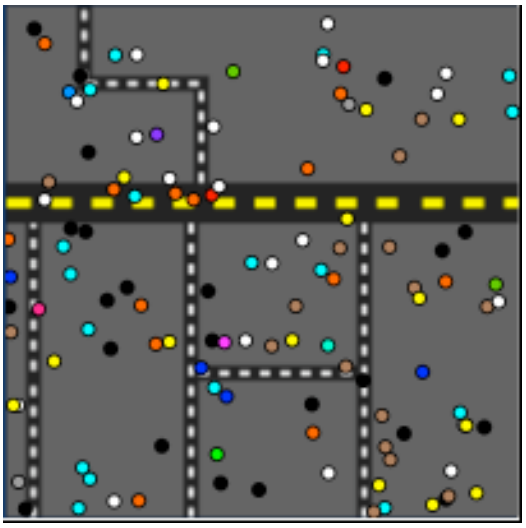
Ethnicity (Asian-30%
Hispanic-20%
Caucasian-10%
African American-30%
Other- 10%)

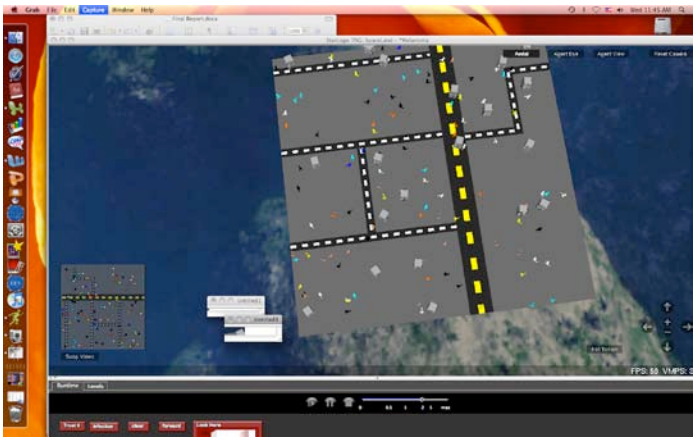
Implementation

Agents:

The agent in our Starlogo TNG model is “people”. People is divided into five different races (African, Hispanic, Asian, Caucasian, and other). African “people” are brown, Hispanic “people” are orange, Asian “people” are yellow, Caucasian “people” are white, and other “people” are cyan.

Screen Shots:





Results

When we run the model,

Things we look for are:
-How many are “infected”, meaning they have ALM?
-How many are not “infected”?
-How many healed?
-How many heal, but then get ALM again?

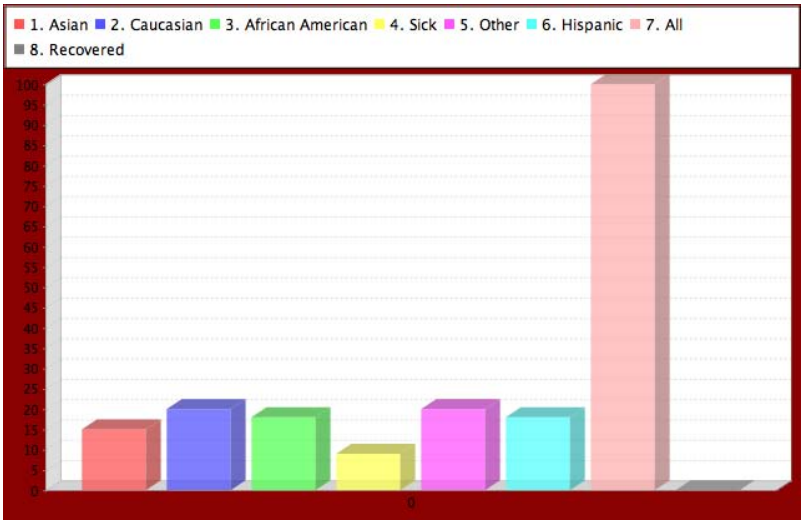
Test	1st Time	2nd Time	3rd Time	4th Time
# Infected	15	22	11	8
# Not Infected	n/a	n/a	n/a	n/a
# Healed	5	0	6	0
# Get it again	n/a	n/a	n/a	n/a

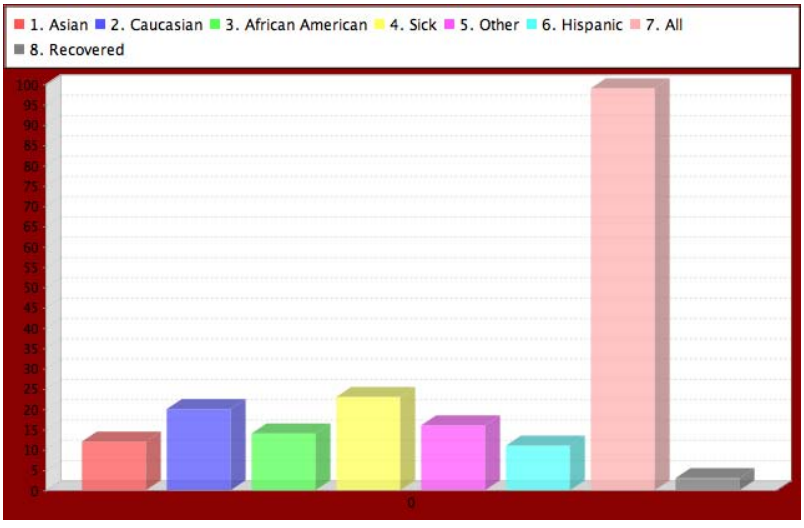
(To gather these numbers we used graphs on the model Approx)

So according to the model, on average, 14 people get infected, n/a do not get infected, 2.75 people have treatments and heal, n/a have treatments but get it again throughout the model tests.

Results (continued)

Graphs from model:





Next Step

If we had another six months to work on this project, we would first translate our Starlogo TNG code into a code for Netlgo, because when we try to add more complex things to the Starlogo code, the whole thing just “crashes”. Then we would start to add more factors and agent characteristics like where you live, how many moles they have, ect. We would also contact more doctors and try to find our what factors are common between patients diagnosed with ALM. Most importantly we would try to learn how to program more on Netlogo, because that’s a skill that we can carry with us for a long time.

Achievements

Karina:

By being part of Supercomputing and GUTS, these past two years, I've learned a lot of things I might not have gotten the chance to learn anywhere else. Like, for example, programming on both Netlogo and StarLogoTNG. I've learned how to divide work evenly with my team members and also have improved my presentation skills. Now I can present things in front of large groups without getting nervous. We also had a couple of big deadlines throughout the year and I had to get organized so things would get finished on time. The biggest thing was that, of course, I learned about Acral Lentiginous Melanoma.

Sandra:

During this first time experience, I learned a lot. I learned that teamwork would lead us to get what we need done. I learned presentation skills as well. I also learned to have patience and count on each other. I really appreciated this experience, because this taught me a lot; therefore, learning from my mistakes.

Kelsey:

This is the first time I've been in supercomputing and I've learned a lot. I learned how to work better in teams considering I like to work alone most of the time. I also learned how to present in larger groups than usual. Another thing I learned is stuff about the melanoma. It was easy to learn because it is rare and there isn't much info, which means we learned how to dig deeper for information.

Acknowledgments

Super Special Thanks to the Following:

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Aurelio Falconi for editing our papers

Alberto Ortega for helping us program

References

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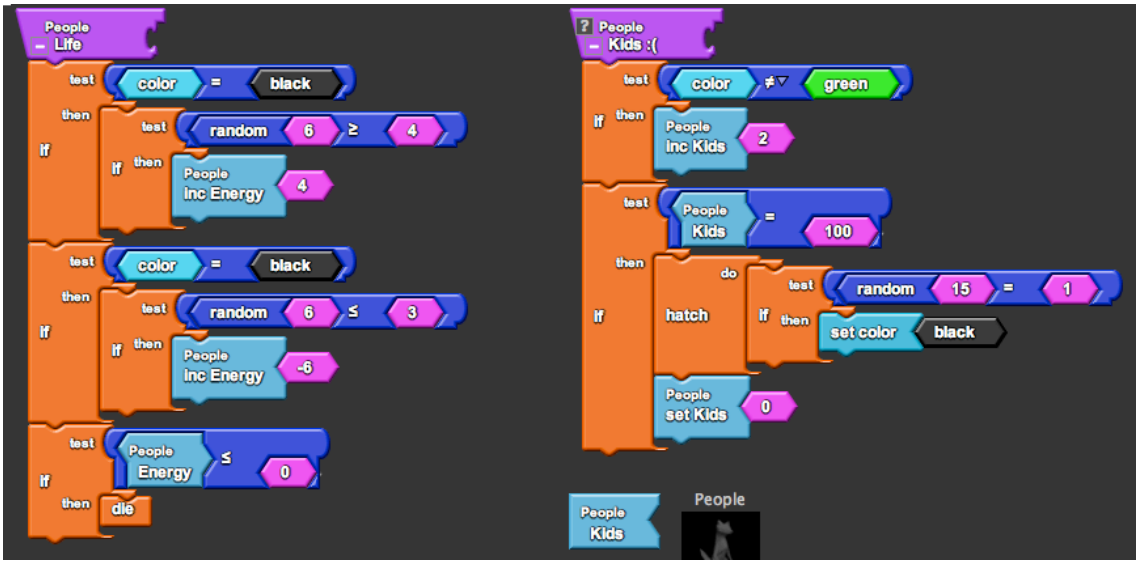
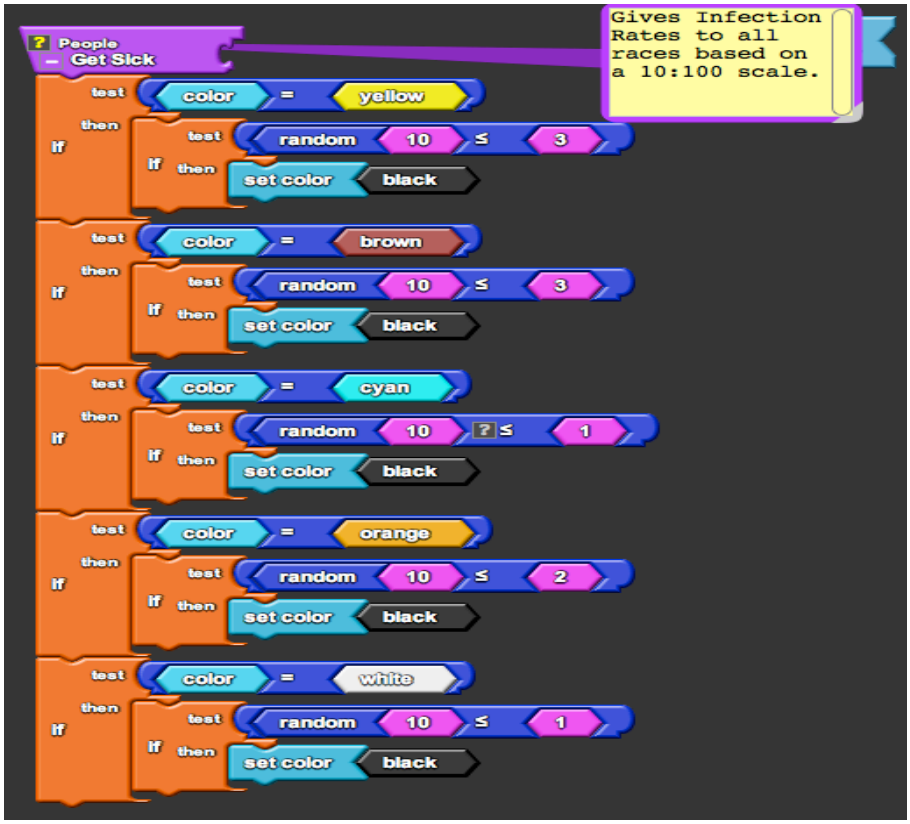
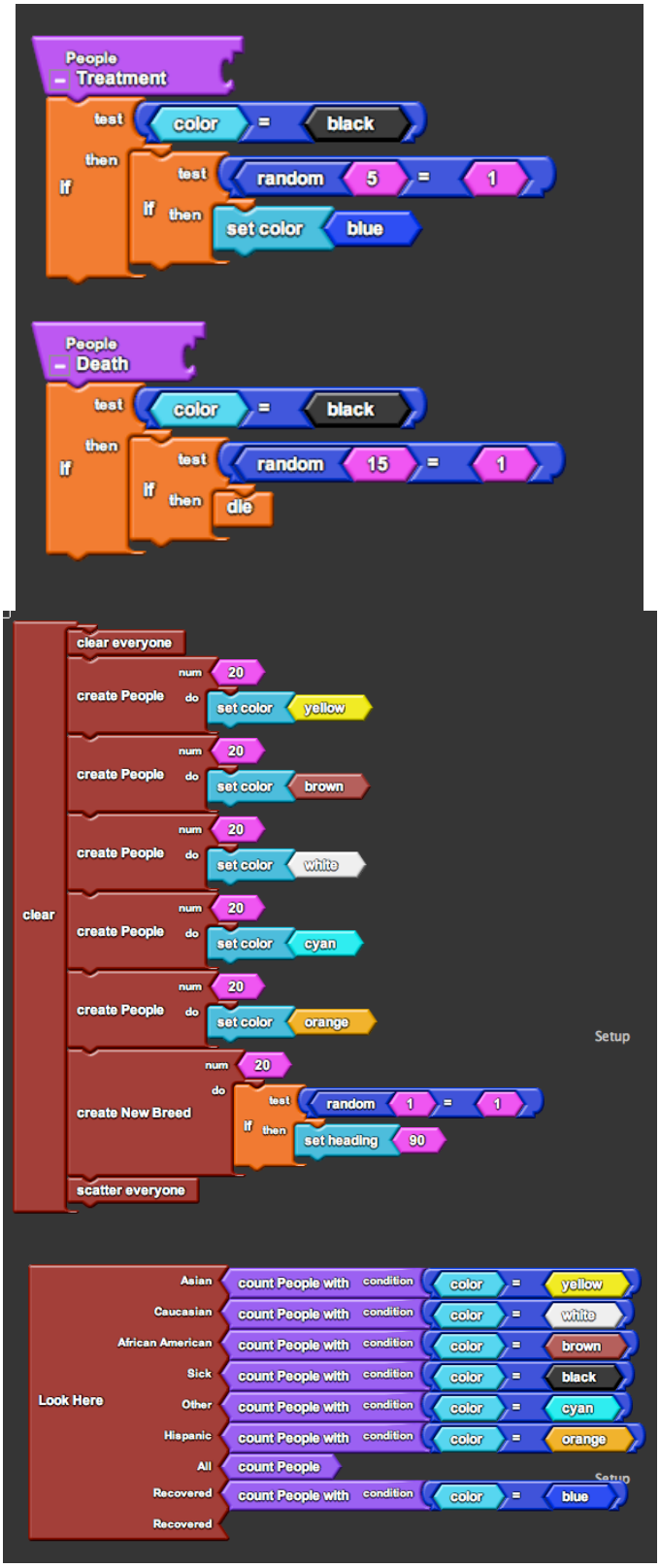
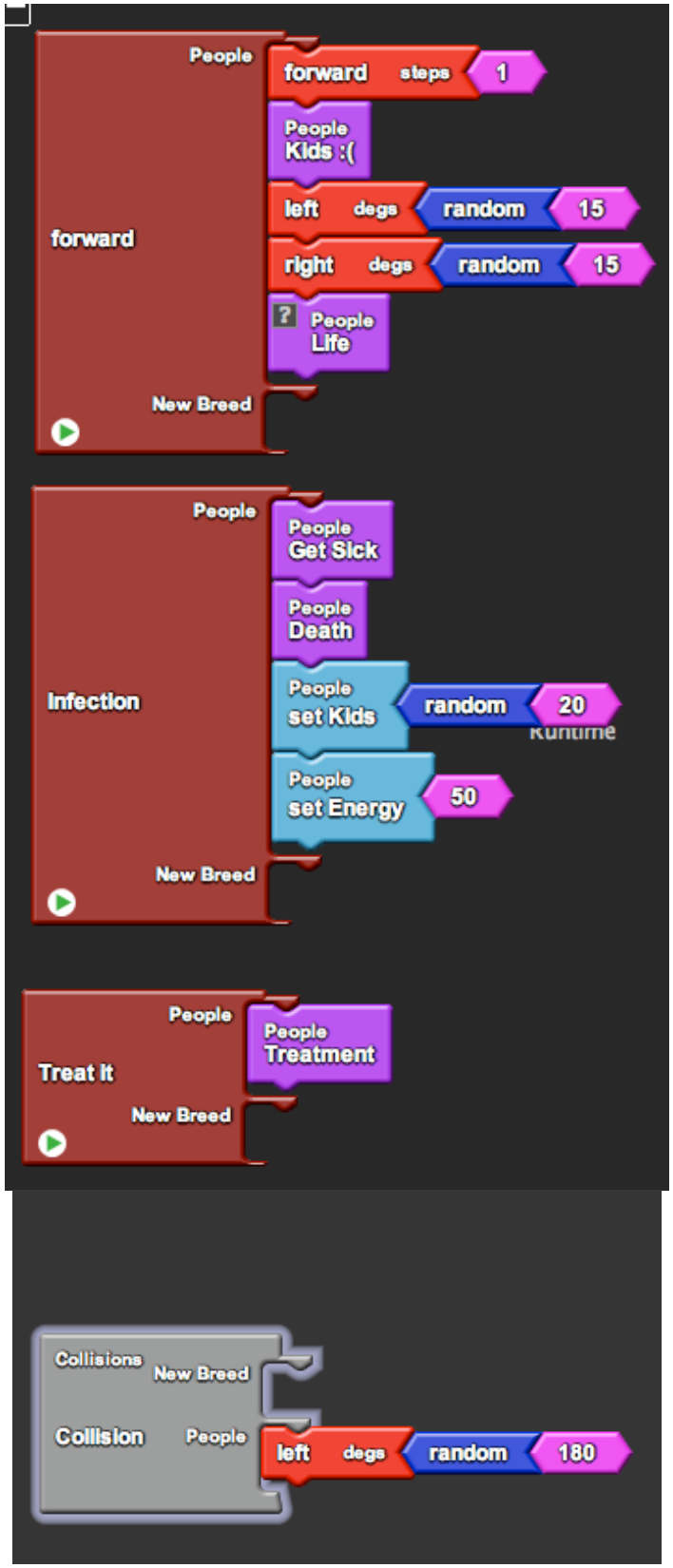
Appendix


People
Life
test
color = black
then
if
test
random 6 ≥ 4
then
if
People
Inc Energy
4
test
color = black
then
if
test
random 6 ≤ 3
then
if
People
Inc Energy
-6
test
People
Energy ≤ 0
then
if
die
People
Kids :(
test
color ≠ green
then
if
People
Inc Kids
2
test
People
Kids = 100
then
if
do
hatch
test
random 15 = 1
then
if
set color
black
People
set Kids
0
People
Kids
People


Gives Infection Rates to all races based on a 10:100 scale.
People
Get Sick
test
color = yellow
then
if
test
random 10 ≤ 3
then
if
set color
black
test
color = brown
then
if
test
random 10 ≤ 3
then
if
set color
black
test
color = cyan
then
if
test
random 10 ≤ 1
then
if
set color
black
test
color = orange
then
if
test
random 10 ≤ 2
then
if
set color
black
test
color = white
then
if
test
random 10 ≤ 1
then
if
set color
black


People
Treatment
test
color = black
then
If
test
random 5 = 1
If then
set color blue
People
Death
test
color = black
then
If
test
random 15 = 1
If then
die
clear everyone
num
20
create People do
set color yellow
num
20
create People do
set color brown
num
20
create People do
set color white
clear
num
20
create People do
set color cyan
num
20
create People do
set color orange
num
20
do
create New Breed
test
random 1 = 1
If then
set heading 90
scatter everyone
Setup
Look Here
Asian
count People with condition
color = yellow
Caucasian
count People with condition
color = white
African American
count People with condition
color = brown
Sick
count People with condition
color = black
Other
count People with condition
color = cyan
Hispanic
count People with condition
color = orange
All
count People
Recovered
count People with condition
color = blue
Recovered
Setup


People
forward
steps
1
People
Kids :(
left
degs
random
15
right
degs
random
15
?
People
Life
New Breed
forward
People
People
Get Sick
People
Death
People
set Kids
random
20
People
set Energy
50
New Breed
Infection
People
People
Treatment
New Breed
Treat it
Collisions
New Breed
Collision
People
left
degs
random
180