

PROBLEM STATEMENT

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SPREAD OF HIV AIDS THROUGH AGENT-BASED MODEL

STUDY THE DYNAMIC INTERACTION OF HIV WHILE CONSIDERING VARIOUS FACTORS.



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MOTIVATION AND WHY THIS SIMULATION?

- This simulation aims to understand how to analyse and predict the spread of HIV by considering the population as agents. We studied the interaction of the disease while keeping in mind factors like average condom use, coupling tendency, commitment period and infectiousness rate.
- To understand how certain factors affect the rate of infection and how to prevent or reduce the spread.

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AGENDA

Topics to be presented



01 Introduction

02 Variables

03 Mathematical Model

04 Software- NetLogo

05 Simulation Model

06 Conclusion



INTRODUCTION

Our Approach

We're using ABM to study the spread of HIV. To understand the behaviour of a system and what determines its consequences, an agent-based model (ABM) is a computational model for simulating the activities and interactions of autonomous agents (both individual and collective entities such as organisations or groups). We have used NETLOGO Software for our simulation.



HOW DOES HIV SPREAD

HIV mainly spreads through sexual contact. When an uninfected person comes in contact with an infected person, the chances of the disease spreading increases. It can also spread through contact with infected blood, like blood transfusions, infected syringes etc.

Variables

Population

0-10k

Population in our model varies from 0-10k to see and analyse the spread of HIV.

Infection Rate

12-25%



According to the research conducted by us, we have found that the infection rate of HIV dwells between 12 and 25%. So, we have kept it unfixed to vary it and see the changes in the spread at different rates.



Variables

Average Condom Use

0-100%

Average condom use indicates the rate at which a person uses the condom while having any physical interaction. So, changing this variable in the model makes a significant difference in the pace at which the spread of HIV amongst the population takes place.

Average Test Frequency

0-2 per year

This variable suggests the number of times any person gets tested for HIV when in doubt of getting HIV because of getting the information that their partner is HIV positive or has some symptoms.



Variables

Average Coupling Tendency

0·5

Average coupling tendency indicates at which rate any person tends to get involved with any new partner in a year.

Average Commitment

0·1400 (days)



According to our research, we have come to a conclusion that the average commitment rate of any couple varies between the figure given above.



Control Mechanism

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Medicinal Use

- In order to control the spread a drug called PrEP (Pre-exposure prophylaxis) is introduced in the code. ≡
- The people who are at a high risk of the infection are supposed to take this daily and this decreases their chances of getting the disease by 90%.



Mathematical Model

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Population	Person Righty	Person Lefty
100000	50000	50000

Infection%	Average Coupling Tendency	Average commitment	average condom use	Test frequency	Coupled	Condom U	Infected or not
14	4	248	77	2	1	0	Infected
15	3	294	64	1	1	0	Infected
19	3	688	47	0	1	1	Not Infected
24	5	437	56	2	1	0	Infected
12	5	659	16	0	1	1	Not Infected
17	4	77	14	2	1	1	Not Infected
20	3	693	26	0	1	1	Not Infected
13	2	1159	62	2	1	0	Infected
22	4	386	96	2	1	0	Infected
14	3	1033	35	0	1	1	Not Infected

Simulation Model

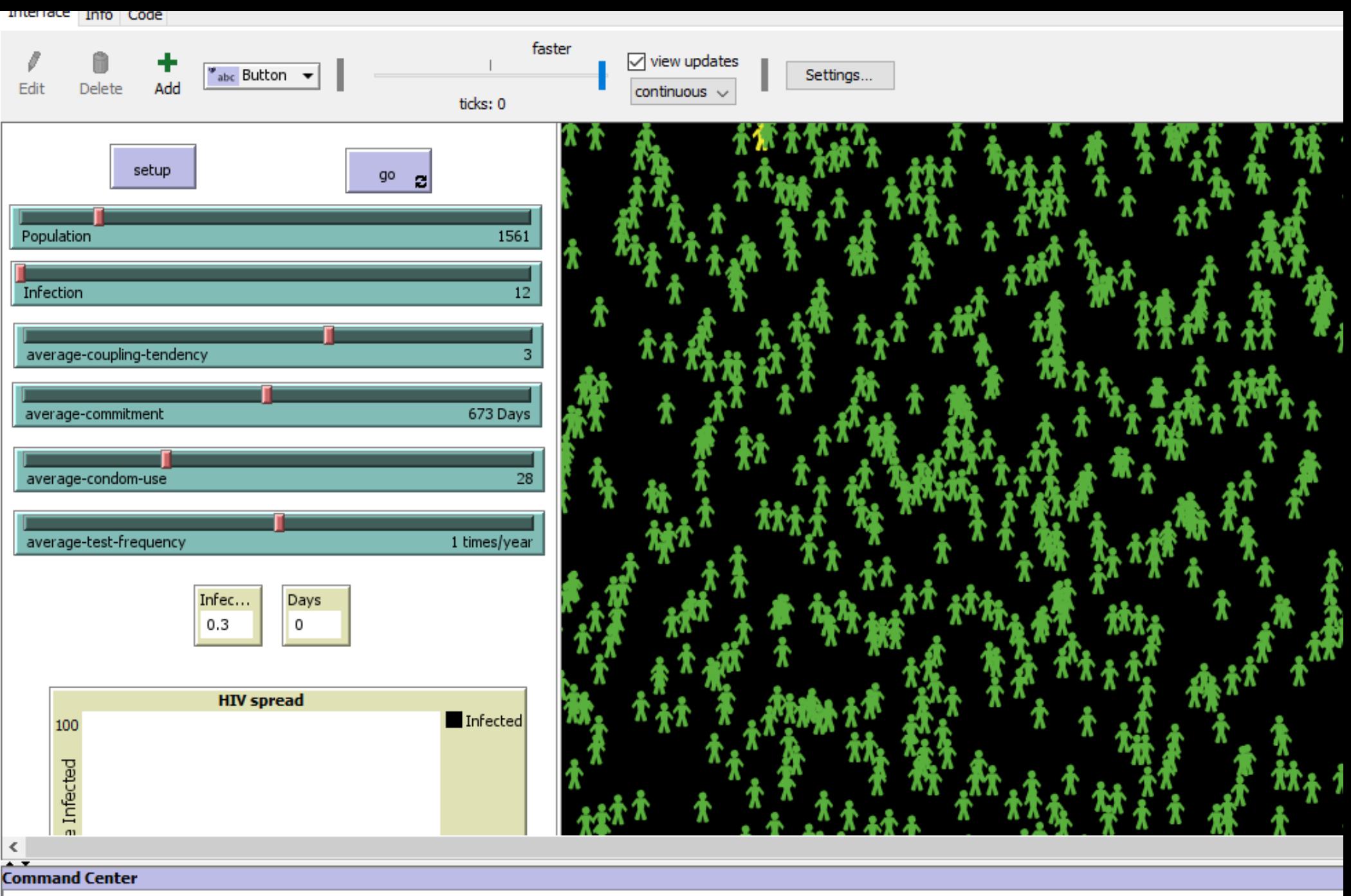
For Reference-

Green- HIV Negative

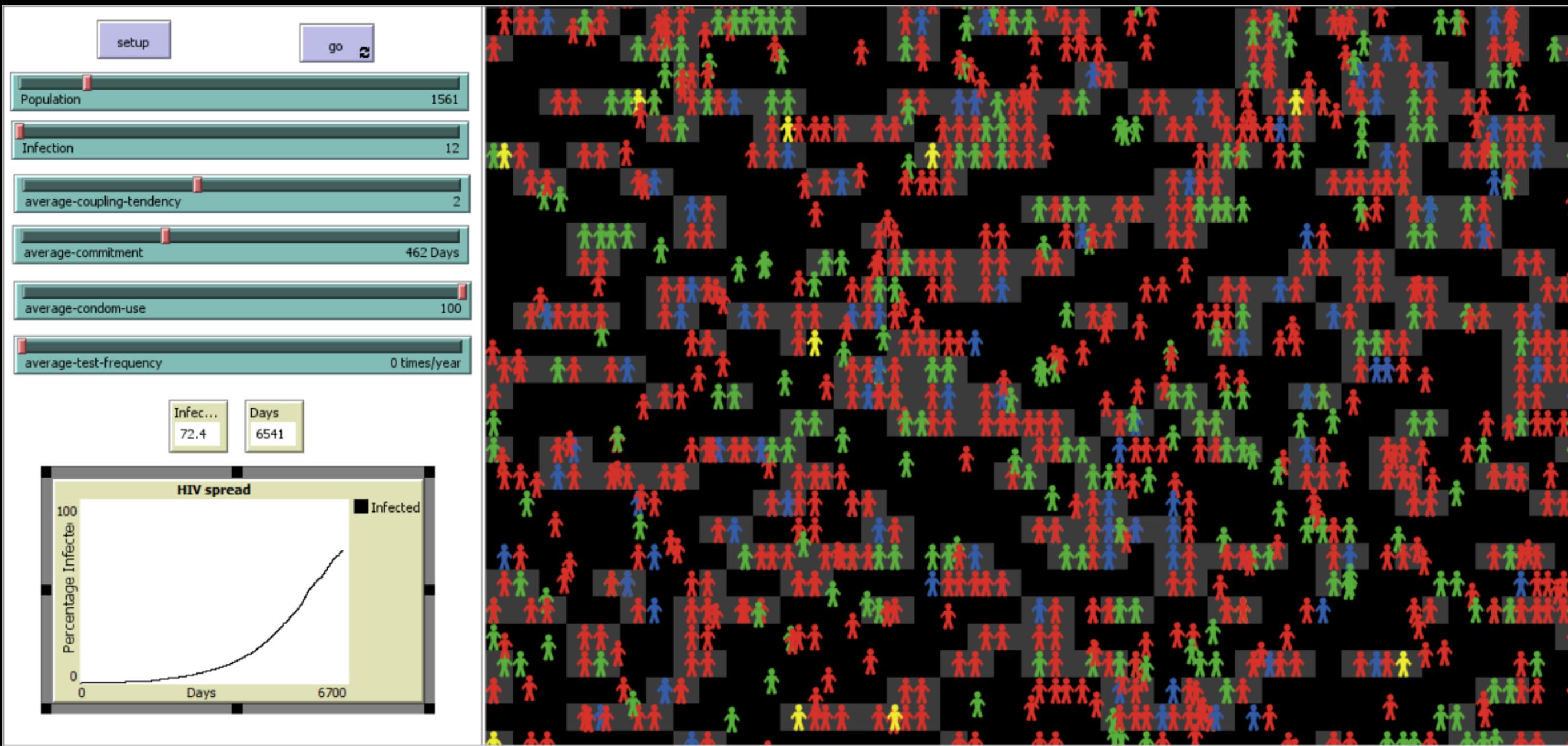
Blue- Medicated

Yellow- Infected but not known

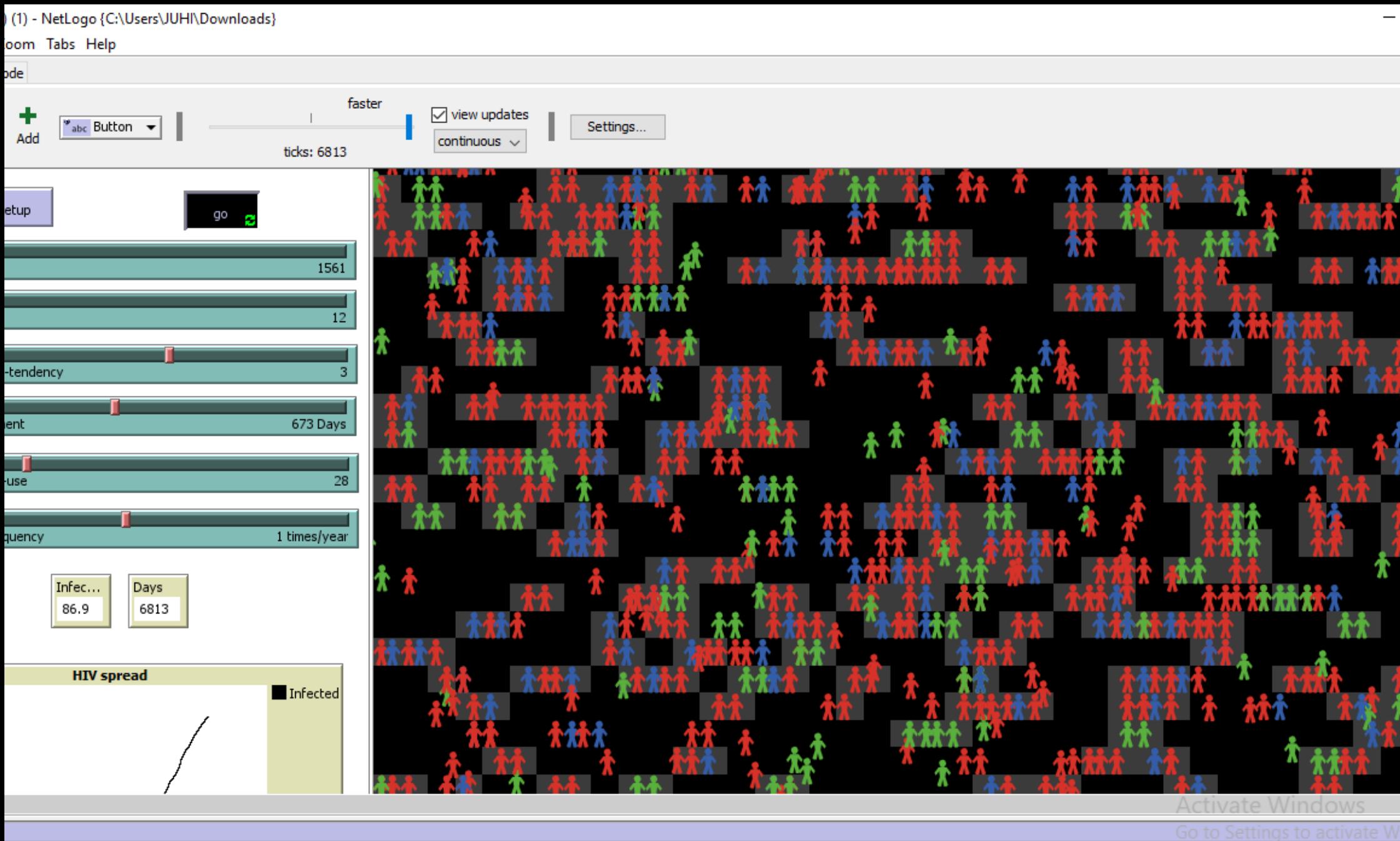
Red- HIV Positive



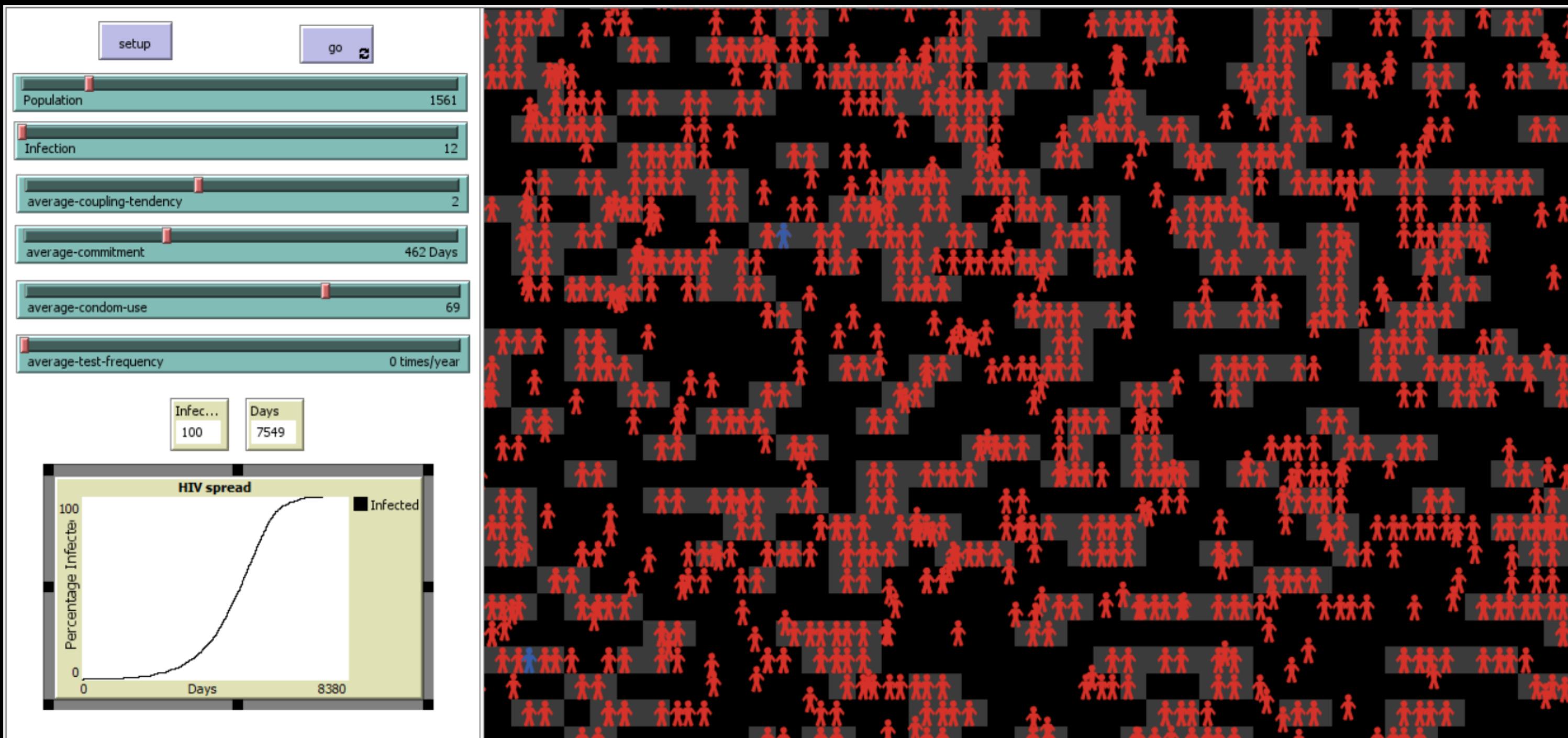
Simulation Model



Simulation Model



Simulation Model



LIMITATIONS AND FUTURE SCOPE

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LIMITATIONS

- No gender specification, male females not considered.
- Small factors which are not very significant like IDUs, and unsafe medical practices not included.
- The software starts running slow when a greater population is considered, so we only consider the population till 4000.

FUTURE SCOPE

- Variables like MOTHER TO CHILD can be added, which we are trying to do. 
- The population can be divided into genders to be a little more specific.
- New births and deaths should also be included to get a realistic approach.



THANKYOU