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EECS 372

Designing and Constructing Models with Multi-Agent Languages

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Safe Sex Attitudes and Behaviors

In the presence of an …. Spread of STI + safe sex attitudes and behaviors

**Overview**

This model aims to simulate the spread and development of safe sex attitudes and behaviors in response to the prevalence of a sexually transmitted infection (STI) throughout a social network of young adults. It also takes into account how these variables influence one another and change over time using theories of attitude change and certainty.

This project specifically focuses on modeling college students in the United States. Male and female students come to universities with diverse backgrounds, including education and attitudes towards(regarding???) safe sex behaviors.

**Relevance and Motivation**

… focus more on the sexual attitudes and behaviors of agents in relation to the spread of STIs. Hopefully this will also more clearly distinguish my model from the AIDS or Virus model, which was a concern that both the TA and I had.

**Guiding Questions**

* What factors seem to be most influential in determining whether an individual will contract an STI?
* What factors influence the spread of attitudes towards safe sex?
* Are the two above questions interdependent? What implications could this have for targeting information campaigns to this age group?

**Model Parameters**

Social network: users can control control the number and size (members) of cliques, and whether they are initialized with some inter-group links. These cliques consist of agents that primarily interact with members of the same group.

:: Parameters to initialize a social network, consisting of discrete social groups (cliques).

num-cliques (range 1-20)

clique-size (range 1-35)

avg-num-friends (range 2- 1-cliquesize)

social-butterflies?

:: Enable to initialize a limited number of inter-group links between "clique leaders".

STI: users can control the likelihood of an infection spreading during an unprotected sex(ual??) encounter, and which genders (if any) show symptoms of the infection

:: STI characteristics

infection-chance (0-100)

symptomatic?

:: Select a person to have an STI

select

infect-random

go-once

go

show-labels?

Attitude: users can separately define the initial likelihood a male vs. female agent will practice safe sex. \_(This attitude evolves during the course of the model.) -- remove?

Certainty: agents have an initial confidence in their opinion, which might be influenced by factors such as parental guidance or religious background

Justification: users can indicate the percentage of agents that receive sexual education including condom use. (The current value in America is about 48%)

:: Attitude: Intention/desire to use a condom

avg-male-condom-intention (0-100)

avg-female-condom-intention (0-100)

:: Certainty: Could include parental influences, religious background, etc. -->> explain!! \*\*

avg-mesosystem-condom-encouragement (0-100)

:: Justification: accurate knowledge about safe sex practices and benefits

PLOTS

Components of safe sex behavior

average safe sex likelihood --> histogram

% of Population Infected

**Agent Behavior:** *How do the agents behave/work?*

On each tick:

Agents talk to their friends (indicated with blue links), and potentially update their opinions about (and consequently likelihood to practice) safe sex.

Agents look for a sexual partner (male-female coupling). If they already have one, they have sex. The likelihood that the couple will engage in safe sex depends on the willingness of both participants.

If one of the partners is infected and the couple has unprotected sex, there is a chance that the other partner will become infected. An infected agent is distinguished by a dot on their shape.

Only agents of genders that are symptomatic (set by the symptomatic? slider) will know they are infected. If an agent knows s/he is infected, s/he will always want to practice safe sex for the rest of the simulation.

If an agent has unsafe sex and doesn’t notice any consequences (either is not infected, or is not symptomatic), that agent’s inclination to practice safe sex will decrease.

Creating custom attitudes for each agent, rather than blanket assumptions about actions

**Rationale for agent rules:** *Why did you give the agents these rules?*

**System behavior:**

The NetLogo system will model the spread of sexually transmitted diseases (STIs) between young adults (male and female), based on their attitudes and behaviors regarding safe sex. … and the interaction between the two?

**Agent behavior and rationale:**

Rather than having turtles generate a network, just generate it for them to simplify. Mostly discrete social circles, with some social butterflies that have links to members of other social groups. (in creating this functionality, used Sophia sullivans final project on modeling commons as a starting point, then adjusted breeds and other parameters as necessary). Turtles start with a certain number of friend links, and no sexual partner links. Since sexual partner links will break any sort of link between 2 turtles when the relationship ends (rather than going back to being friends), turtles also have the chance/opportunity to make more links than their original number – this helped fix/account for all links between genders breaking and becoming discrete, gender-segregated friend groups, which isn’t realistic.

The turtles do not move, but one each tick, if they are not coupled, they might try to find another single turtle of the opposite gender /someone to mate with (based on their personal coupling tendency). First they look at friends of the opposite sex, if they have none, then they choose a person of the opposite sex within their friend group, and if there isn’t one, then they resort to choosing the closest non-linked opposite sex turtle. The probability of successfully coupling decreases for each of these 3 types of potential partners. If both partners are willing to become a couple, they form a sexual-partner link (if the two turtles were previously friends, this destroys their friendship link).

If the turtles are coupled, on each tick, they have sex, and have a chance of using protection based on…. If the couple does choose to use a condom, there is a chance that they will use the condom correctly, based on stats from WHERE??? If one of the partners is infected, on each tick with their partner, there is a chance that they will spread the disease to them. This chance is based on whether or not the couple chose to use a condom, whether or not the condom was used correctly (which influences how successful the condom is at preventing infection), and the infectiousness of the disease.

Form of safe sex in question is condoms, because most prevalent and accessible in the demographic I’m interested in modeling.

network connections could potentially be a reasonable way to model friend circles, which could influence behavioral choices and attitudes towards sex and using protection.

I had originally been primarily interested in seeing how an STI that is symptomatic for only one gender travels through the population and potentially reaches some sort of stable state. However, based on the feedback I have received, I think I will focus more on the sexual attitudes and behaviors of agents in relation to the spread of STIs. Hopefully this will also more clearly distinguish my model from the AIDS or Virus model, which was a concern that both the TA and I had. I still need to find some supporting articles/other research in order to root some of the assumptions of my model.

The updated plans for my model are as follows:

System behavior:

The NetLogo system will model the spread of sexually transmitted diseases (STIs) between young adults (male and female), based on their attitudes and behaviors regarding safe sex.

Agent behavior and rationale:

Turtles will move around randomly mostly within a specified area, in order to try to recreate circles of friends or divisions of populations. This has not yet been implemented, but the NW extension or links may be used to confine movement. If a turtle is closely linked to another turtle of the appropriate gender to mate with, there is a probability they will mate. If they mate, there is a probability they will use a form of protection. This probability will be influenced by attitudes and behaviors towards safe sex that a given turtle has, and these attitudes/behaviors are influenced by the other turtles (“friend group”) that the turtle is linked with. If the coupled turtles use protection, there is a probability of using it correctly – if protection is used correctly, it is assumed that the disease will not be passed on. If the protection is used incorrectly or no protection is used, there is a higher probability that the infection will be passed to the partner of the agent.

Depending on the disease and whether an agent is male or female, the agent will feel symptoms. It will be assumed that if the agent detects symptoms, they get checked by a doctor, are diagnosed, and are gradually cured of the infection. Additionally, there is a chance that a turtle will randomly get tested, despite whether they are currently symptomatic – this probability may also be impacted by their attitudes towards safe sex.

Sample Outcomes

Members of the same social group influence one another’s attitudes

Still has a negative attitude towards wearing a condom, because he doesn’t realize he is infected

Dot color indicates whether the agent knows they have an STI (based on being symptomatic)

Once an agent realizes they have an STI, they form a strong desire for safe sex

Analysis & Sample Trials

**Model/System Behavior:** *How does the overall system behave/work?*

**Model output:** *Do you think your model currently provides a good description of the system’s behavior? Why or why not?*

**Limitations, Assumptions, Simplifications**

**Assume:**

Only 1 type of STD

If they are symptomatic, they will know they have an std, and will want to practice safe sex from there forward (assuming that people are kind and not malicious)

Assume no testing/curing takes place? just whether they get an std??? not susre……\*\*\*

the turtles don't get cured of this std, because after having an std, they always want to practice safe sex, so its about the same effect anyway (if i dont get condom accuracy stuff in)

Assumptions:

if they know they are infected, want to use safe sex

no friendships die, no social group membership changes

Should agents be able to have multiple sexual partners? --> NO

Should people get treated and cured…?? no

gender balance workgroups?? no, it is randomized

make friends (will only be called if the turtle has not reached their maximum friend limit) and their tendency is acceptable

\*\*Clarify condom use as ONLY?? mode of safe sex protection form

Explain how **percentages of types of sexual education throughout america/ levels of knowledge of safe sex when entering college were created. decided** Don't need stats on percentages of prevalence of STIs in target demographic, to start out simulation (rather than having person choose to infect people) …. since could vary, and want to also simulate without an infection present, which could potentially be younger kids??

**Evolution of Model:**

decided to eliminate:

vocality - used certainty instead for simplification. but could be an extension? this model assumes that the agents are willing to talk about the sensitive topic of safe sex behaviors with their peers, which may not be true at all se

was interested in media/environment influences - since a lot of articles written during time that hiv/aids was exploding, prior to that condom use/protection/safe sex more about preventing pregnancy…. but left as extension for user

**Extensions/didn’t get to**

interaction between sexual partners and peers equal or no?

media/environment influences - since a lot of articles written during time that hiv/aids was exploding, prior to that condom use/protection/safe sex more about preventing pregnancy…

**NetLogo Features**

should I have 2 breeds of sexual links? or just one with a type and color….? 2 breeds

**References, Related Models**

used sophias as a starting point, but only took relevant stuff, mostly just network generation and creating spatially separated clusters - e.g. no equivalent to bosses in my model, so removed...

**Questions:** What questions do you have about your model?

**Next steps:** Briefly list your next steps for improving the model.

Creating custom attitudes for each agent, rather than blanket assumptions about actions

Establishing networks consisting of "friendship" links and "sexual partner" links

Implementing (or deciding whether it is valid to implement) whether a particular gender is symptomatic of an STI, therefore becoming aware of it, getting treated, and potentially changing their future behaviors

-- Determining what factors inform/influence attitudes towards safe sex (and consequently behaviors), and to what extent they do so [potential options: attitudes of parents/friends/sexual partners, infection history of self or friends, education/awareness of safe sex practices]

-- Implementing likelihood of proper use of sexual protection based on statistics, and consequently different potential rates of transmission

-- Investigating whether a female being on birth control is a valid parameter that might impact whether she chooses to engage in safe sex

I will do further research in order to determine and more accurately base some of the assumptions of this model in scientific literature.

likelihood higher than either alone - can't force numerical score though (????)

attitude (change?) is a function of certainty

certainty only impacts how much their opinion will change by talking to peers

updated attitude only depends on previous attitude and justification

rather than whole change happen only fraction of change - dampening