**4Project status Report**

# PROJECT TITLE: Epidemix

Agent-Based Modeling

| NAME | REG.NO | ROLE |
| --- | --- | --- |
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|  |  |  |

# project Executive Summary

### Context:

**The Epidemix project, on ‘Agent-Based Modelling for Infectious Disease Spread' is an initiative designed to develop a simulation environment using agent-based modeling (ABM) techniques. The essential objective is to enhance our understanding of the dynamics of infectious disease transmission and to evaluate the effectiveness of various intervention strategies. This project leverages Python for the implementation of the ABM framework, ensuring integration with existing analytical tools, and we aim to visualize outputs to inform and shape decisions.**

### Objectives:

**1. Simulation Environment Development: Create a robust ABM environment that can simulate the spread of infectious diseases through a population.**

**2. Agent Interaction Modelling: Model interactions between individual agents (representing people), and disease vectors (like pathogens).**

**3. Behavioral and Environmental Factors: Incorporate social behaviors, movement patterns, to reflect realistic scenarios of disease transmission, and include data on age for example to assess age-based vaccination.**

**4. Descriptive Analysis: Utilize the model to evaluate disease spread dynamics under various conditions and intervention strategies.**

**5. Intervention Evaluation: Assess the impact of different public health interventions (such as vaccination, treatment) on meningitis spread.**

### Methodology:

**- Agent-Based Modeling: Develop individual-based model for meningitis which has unique characteristics, eg infectiousness, duration of infection, etc.**

**- Python Implementation: Use Python for the development of the ABM due to its powerful libraries, ease of use, and strong community support - Starsim**

**- Data Integration: Incorporate real-world data on age, and other data to enhance model accuracy.**

**- Simulation Scenarios: Run multiple simulation scenarios to explore different aspects of disease transmission and control measures.**

### Expected Outcomes/Outputs:

**- Enhanced Understanding: Gain insights into the factors influencing the spread of infectious diseases.**

**- Predictive Insights: Provide predictive insights into potential outbreaks and the effectiveness of intervention strategies.**

**- Policy Guidance: Offer data-based guidance for policymakers to develop effective public health strategies like governments.**

**- Research Advancement: Contribute to the scientific community with a detailed model that can be adapted and expanded for future research on various infectious diseases.**

### Project Timeline:

**- Phase 1: Figma design for website to document our work and for educating the public and Model Design**

**- Phase 2: Development of ABM Framework in Starsim and its UI**

**- Phase 3: Data Integration and evaluating it**

**- Phase 4: Simulation and Analysis**

**- Phase 5: Rollout/Dissemination to whoever needs it**

# DAILY REPORTS

| **DATE** | **DAILY ACHIEVEMENT** | **CHALLENGES/BLOCKERS** |
| --- | --- | --- |
| 02/05/2024 - Thursday | Picked on Agent-Based Modelling from the opening of Attachment(Mention/Overview of Projects) | None - Maybe team formation based on interests was chaotic. |
| 03/05/2024 - Friday | Went to the lab, first time, interacted with the team; learned about the strengths of each person. | None |
| 06/05/2024 - Monday | Did research on existing solutions on the internet | None |
| 07/05/2024 - Tuesday | Read on the specifics of the libraries to use and modeling and simulation environments in general: Starsim and Mesa and read articles from the internet | None |
| 08/05/2024 - Wednesday | Looked at existing solutions on the internet, eg. ones done in NetLogo, Repast, Mesa | None |
| 09/05/2024 - Thursday | Started Figma design of the initial website structure | None |
| 10/05/2024 - Friday | Continued on our Figma file; and finalized it  Would be React.Js based | None |
| 13/05/2024 - Monday | Individual certifications for each person (if relevant) | None |
| 14/05/2024 - Tuesday | Kept reading on more research and articles on ABM and IDM | Finding the right information from the articles |
| 15/05/2024 - Wednesday | Run a first version of the model on a Jupyter notebook. | None; it worked correctly on Ubuntu/Linux but not on Windows |
| 16/05/2024 - Thursday | Made Streamlit server environment of the model; made a Streamlit UI to set model parameters as sliders | UI doesn't communicate correctly with the model; separation of concern logic was probably wrong |
| 17/05/2024 - Friday | Presented our approach in front of panel to gauge our understanding of the project | None |
| 20/05/2024 - Monday | Made initial website in React from the Figma frames | None |
| 21/05/2024 - Tuesday | Swapped React with Bootstrap for the website; this was all based on flexibility and speed of the site. | None |
| 22/05/2024 - Wednesday | None | None |
| 23/05/2024 - Thursday | Re-structured website into pages: a page for index/home, model, about us and resources | None |
| 24/05/2024 - Friday | Switched to the model; made a Gradio UI for inputs and visualizations | Putting all UI structure in one Gradio server |
| 27/05/2024 - Monday | Reviewed website feedback from JHUB and pinpointed what to work on and what to retain. | None |
| 28/05/2024 - Tuesday | Worked on the final outlook of the page;  deployed website to GitHub page;  readied the site for deployment to JHUB | None |
| 29/05/2024 - Wednesday | Each person worked on certifications | None |
| 30/05/2024 - Thursday | Website deployed to JHUB | None |
| 31/05/2024 - Friday | Focused on how we can leverage Django for the model backend | Separation of concern logic was probably wrong. |
| 03/06/2024 - Monday | Worked on the django model; visualized normal infection spread. | Bugs |
| 04/06/2024 - Tuesday | Tried debugging vaccination | Few bugs |
| 05/06/2024 - Wednesday | Presented our ABM prototype in front of panel | None |
| 06/06/2024 - Thursday | We tried to integrate vaccination functionality. | Difficulty in implementing the logic |
| 07/06/2024 - Friday | Looked for ways to figure out how to implement logic. |  |
| 10/06/2024 - Monday | Improved on debugging the vaccination problem. |  |
| 11/06/2024 - Tuesday | Worked on separation of concerns. |  |
| 12/06/2024 - Wednesday | Cracked the vaccination part. | None |
| 13/06/2024 - Thursday | Refined vaccination functionality | None |
| 14/06/2024 - Friday | None | None |
| 17/06/2024 - Monday | Holiday | None |
| 18/06/2024 - Tuesday | MVP presentation | None |
| 19/06/2024 - Wednesday | None | None |
| 20/06/2024 - Thursday | None | None |
| 21/06/2024 - Friday | None | None |
| 24/06/2024 - Monday | Worked on age-based vaccination | Complex logic |
| 25/06/2024 - Tuesday | Debuggig age-based vaccination | Difficulty in incorporating the logic as views. |
| 26/06/2024 - Wednesday | fixing age-based visualization | None |
| 27/06/2024 - Thursday | None | None |
| 28/06/2024 - Friday | Graduation (no labs) | None |
| 01/07/2024 - Monday | Cracked age-based vaccination | None |
| 02/07/2024 - Tuesday | Started working on the treatment. | Few bugs |
| 03/07/2024 - Wednesday | Configured CSS to the app | None |
| 04/07/2024 - Thursday | Styled the app, especially adding sliders for the parameters. | None |
| 05/07/2024 - Friday | We made more styling changes to the app | None |
| 08/072024 - Monday | Managed to implement the treatment intervention. | None |
| 09/07/2024 - Tuesday | Made more styling to the model | None |
| 10/07/2024 - Wednesday | Brainstormed on ways of adding gamification | Complex steps to incorporate gaming into the model in the short time left, but a definite route to follow in the project's future. |
| 11/07/2024 - Thursday | Configured URLs for a landing page | None |
| 12/07/2024 - Friday | Added a landing page and packaged the model as a complete app | None |
| 15/07/2024 - Monday | Added the prevalence summary to the model. | None |
| 16/07/2024 - Tuesday | Made some recommended changes to the website | None |
| 17/07/2024 - Wednesday | Tried hosting the model to huggingface and python everywhere | Paid subscription required for enough storage to cover our model. |
| 18/07/2024 - Thursday |  |  |
| 19/07/2024 - Friday | Fine tuning the model’s appearance | None |
| 22/07/2024 - Monday | None | None |
| 23/07/2024 - Tuesday | We focused on completing our certifications. | None |
| 24/07/2024 - Wednesday | Finishing certifications | None |
| 25/07/2024 - Thursday | We wrote some blogs for linked in | None |
| 26/07/2024 - Friday | Wrote presentations for use of the simulation libraries (Starsim, Mesa, and Netlogo) | None |
| 29/07/2024 - Monday | Finalized on the documentations for the project.  Compiled the model and website into one project repository. | None |
| 30/07/2024 - Tuesday | Submitting the complete project |  |
| 31/07/2027 - Wednesday | Presentation |  |
| 01/08/2027 - Thursday | presentation |  |
| 02/08/2027 - Friday | Closure of the internal attachment |  |

# PROJECTS’ NEEDS

* We use google colab and our local machines running Ubuntu/Linux to run simulations
* We might need server environments for deployment later on, eg AWS

# GENERAL BLOCKERS

(22nd May 2024)

* We haven't figured a way (at this point) to create an intuitive user interface in Gradio/Streamli in one place for the model visualizations.
* Setting up backend environment for the model (i. e separation of concerns to use as Python modules for the simulation environment ).
* Restructuring into a Django project logic.

(29th July 2024)

* We decided and managed to build the whole app using Django for both frontend and backend.
* We are likely to add gamification into the model in the near future