Novel Design of the RTS,S Malaria Vaccine Process Train Employing Single Use Systems
(Technical Report)

Vulnerability of the Malaria Vaccine Implementation Network in Sub-Saharan Africa
(STS Research Paper)

An Undergraduate Thesis Portfolio

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By

Nushaba Rashid

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Nushaba Rashid

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Socio-Technical Synthesis

The relationship between my technical work and STS research paper is founded on the vulnerabilities of immunization implementation regimes. Aspects such as unaffordable drug products and diminishing participation in vaccine trials function as the origins of my technical work and research paper. The two works differ in which limitations they investigate. My technical work revolves around the implementation of single-use systems in a malaria vaccine production facility to lower the cost per dose, while my research paper explores societal factors that can interfere with widespread immunization uptake. Although the technical work and STS research explore immunization processes from different perspectives, both works are defined by the common theme of vulnerabilities of immunization practices.

My technical work revolves around designing a vaccine manufacturing plant that produces the malaria vaccine, Mosquirix, by GlaxoSmithKline (GSK) at a lower retail cost in order to be more accessible to the target market. Specifically, my capstone team implemented single-use systems in the design of a manufacturing facility that decreased the production costs for this vaccine. Our plant targets 50% of newborn babies per year in the countries participating in the Mosquirix pilot program who are at risk of contracting severe malaria and could access the vaccine in local clinics. The final design intends to produce 14 million doses of the vaccine in six batches per year. Beyond defining the fermentation, extraction, and purification processes of the

antigen itself, my capstone team also provided the design for an adjuvant production scheme and the accompanying economic analysis for operating the facility.

My STS research explores the critical actors involved in the currently unstable malaria vaccine implementation pilot program network. My research argues that because GSK focused solely on technical aspects of the program, the actor-network is prone to instability due to neglected actors, ill-defined roles of current actors, and unpredictability of future actor participation. My work identifies the human and non-human actors involved in this vulnerable vaccine pilot program by employing Actor-Network Theory (ANT), specifically Michel Callon's concept of Translation. Using ANT, I identify the shortcomings of GSK as a primary actor and how this could potentially lead to the failure of the malaria vaccine launch.

Working on the technical and STS research project concurrently was extremely insightful for both. From the technical work, I learned about the regulations enforced for production and delivery of drug products and was thus able to discern possible weak points in the malaria vaccine distribution process. With this knowledge, I developed a reasonable argument regarding the shortcomings of GSK in establishing an effective vaccine implementation pilot program. Furthermore, the STS research paper illustrated the importance of relevant actor participation in influencing the market demand for vaccines. This was essential information for my technical work to ensure that the design of the vaccine production facility reflected the scope of this specific project. To conclude, simultaneously working on the technical and STS research paper substantially enhanced the quality of work for both and allowed me to explore the various factors that impact the success of drug product production and delivery.