

Thesis Project Portfolio

**Design of an Insulin Glargine Manufacturing Facility in Singapore to Target the Rise of
Diabetes Cases in Asian-Pacific Countries**

(Technical Report)

The Failure of The Affordable Insulin Now Act for the Uninsured

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science
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Bachelor of Science, School of Engineering

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Sociotechnical Synthesis

My technical work and my STS research are connected primarily through the idea of insulin costs, and exploring the efforts made toward providing insulin at an affordable price. My technical work focuses on the design of insulin, prioritizing keeping costs as low as possible while creating a safe and effective drug. My research explores the obstacles that exist that prevent insulin prices from being affordable, specifically focusing on the Affordable Insulin Now Act and its failure to provide affordable insulin for the uninsured. While my technical work and my STS research approach insulin costs from different angles, the theme of obtainable affordable insulin is consistent across both projects.

My technical work explores the design of an affordable insulin glargine product. Insulin glargine is a slow-releasing and long-acting insulin product that is beneficial to those that have to take insulin every day by easing the application and use of the drug. Our capstone team design an insulin manufacturing plant located in Singapore to service the developing and developed nations in the surrounding areas of Asia. The goal of our project was to design a plant that would minimize the costs of insulin while remaining profitable. Ultimately, we were able to produce insulin that sells to the consumer for \$0.0075/unit. Thus, our product will cost someone who weighs 75g \$43.88/month, a much less expensive price for patients when compared to our competitors. While we were able to keep costs low for patients, our yearly revenue is about \$4.8 billion with an internal return rate of 242%, which renders our plant economically viable. Producing 764 batches per year allows us to service 4% of the target market, or 9 million people. Through our research, we were able to prove that an affordable insulin product while remaining profitable.

My STS research also explores insulin costs but from a different angle. My research focuses on the relationships between insulin prices, manufacturer control, and government policy. Specifically, my research paper focuses on the failures of The Affordable Insulin Now Act. The failure in the creation of this policy yields many consequences: enrollees of Medicare Part D will have a \$2,000 out-of-pocket cost for prescription drugs beginning in 2025, uninsured diabetics see no change in insulin prices, and there is no limit to the price that insulin manufacturers can charge. I claim that The Affordable Insulin Now Act failed to be inclusive due to pressure from large manufacturers to retain their monopoly and the United States government's negligence concerning rising insulin prices and high out-of-pocket costs for many diabetic Americans. My paper explores this claim and discusses how influential each of these factors is. My research aims to stimulate a conversation around insulin prices and convince readers that it is possible to reach affordable insulin prices for all people.

Working on these two projects simultaneously greatly added value to both. My technical work gave me a better understanding of the possibility of producing affordable insulin, which helped me provide context for my paper and offer insight into the influence that manufacturers have over insulin prices. My research paper helped me understand that, while manufacturers have a large say in the cost of insulin, policymakers also can pass laws that make insulin prices more affordable. Working on both projects together has allowed me to explore insulin prices from multiple angles and each work contributed to improving the quality of the other. Additionally, researching insulin prices from multiple angles made me more passionate about the discrepancy in accessibility to life-saving products for those above and below the poverty line.