Project Summary for Public Adults:

Medical waste produces a substantial amount of plastic every year. Our project focuses specifically on the syringe. Most syringes on the market are single use and are produced with non-degradable plastics. We focused on producing a single use syringe that was biodegradable and can be used by a wider audience. Some issues that we wanted to address in this project were the following biodegradability, small plunger and barrel ring grips. The biodegradable plastic we decided to make our product from was Poly Lactic Acid (PLA). Degradation testing was performed in three different environments: ocean water, soil and UV exposure. These were chosen keeping in mind that our product will need to be shelf stable and most likely will end up in a landfill or in the ocean. We conducted 3 week degradation tests where PLA was submerged in the materials and the mass lost was observed. SolidWorks was used to simulate strength and integrity tests on PLA.

Many patients that use syringes suffer from mobility issues so we produced three designs for the grip types. Designs to be considered were a standard flat grip, flared grip and a ring grip, keeping in mind that we wanted a grip that would accommodate larger fingers and added stability. We also produced three potential models for the plunger grip. The potential designs were a traditional flat top grip, half-pipe and bowl grip. These potential designs were modeled onto the syringe using SolidWorks. In determining which was the most desirable design we 3D printed each model design using PLA and then conducted a product survey for which design was most comfortable. The most popular designs were the flared grip and the half-pipe. For this project we were limited to using 3D printing due to the size of our budget however it would be ideal to use injection molding using PLA for the syringe as the 3D printed material proved to be quite brittle and the injection molding would provide higher rigidity and durability when the plunger is being pressed down to expel fluid. The results for the degradation tests were not close to the expected degradation percentage of degraded PLA, a reason for this result would be that our chosen environments did not contain the microbes required to break down PLA.