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SEIR Models for Food Contamination Events

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Author Note: Jessye Talley has research expertise in stochastic and deterministic modeling of supply chains using stochastic programming, Markov chains, differential equations, linear programming, and queueing theory. She has a strong interest in the safety and defense of food supply chains which she modeled using compartmental models to show the progression of the illness of a consumer from eating a contaminated food product and the effects of interventions. Her current research interest consists of applications in humanitarian relief, emergency preparedness and response to address ports, healthcare, and food supply chain safety and defense.

Abstract: Food contamination outbreaks are becoming more prevalent in today's society. These outbreaks can occur due to contamination at any point during the food supply chain. This in turn can lead to many illnesses that cause a loss of confidence in the food chain. Two main objectives are considered for this research. The first objective is to consider the food products that are linked to illness. The second objective focuses on determining the optimal food removal policy. Two deterministic differential equations models are used to model these processes. As a result, we are able to see the progression of food through various stages and see how shelf life plays a role in the number of consumers that become ill. We are also able to see the optimal time to remove products from the shelf based on different food types to lessen the number of consumers that will become ill.

Keywords: Food, Contamination, Illness