

**Centennial Honors College**  
**Thomas E. Helm Undergraduate Research Day 2024**

**ABSTRACT**

Major: Mathematics

Poster

Faculty Mentor(s): Amy Ekanayake

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**Modeling Fertility Rate from Life Expectancy**

**Olivia Rueschhoff**

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In this research project, several empirical models were examined to best describe the relationship between the average life expectancy and the average fertility rate in the United States from 1950 – 2023. Both data sets were from Macrotrends.net. The models developed to reflect the data include polynomials, logarithmic, exponential, and power models. We used a 3:1 train-test split to assess the model predictions using the smallest maximum absolute error and the smallest squared sum of residuals. In addition, the trend of the data and the R-squared values were utilized to evaluate the best fit model for the training set. We observed that the best model to represent the data is the sixth-order polynomial. It performed well on the test data: it had the smallest maximum absolute error and the smallest squared sum of errors. It also closely follows the shape of the training data and has the highest R-squared value for the training data. Based on these findings, we conclude that polynomial models are well-suited to describe the average fertility rate per year in terms of the average life expectancy per year in the United States.