

## **The Impact of Screening and Surgery on Life Expectancy in Breast Cancer - A Mathematical Model Case Study in the European Union**

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### **Abstract**

*Background:* In the last 20 years in European Union states, the life expectancy did not change much. In the period 2012-2021 the average life expectancy remained almost constant at 82 years. Breast cancer represents the main cause of death by cancer in women. The purpose of this research is to identify and measure the influence of some medical interventions and procedures related to breast cancer on life expectancy. In our article, the target group is the feminine population from 27 EU countries.

*Methodology:* For the analysis several indicators provided by Eurostat were considered: life expectancy for female population as a dependent variable and breast cancer screenings, surgical operations and procedures performed in hospitals (partial and total excision) were used as independent variables. The research used a mathematical model (regression panel) for 27 EU countries, for a 10 year period, to evaluate the impact of each independent variable on the life expectancy in EU as a whole.

*Results:* From a statistical point of view, screening has a significant effect on life expectancy. On the other hand, surgical interventions have a role in the overall medical process and positively influence life expectancy. The panel model has shown that partial interventions contribute less than screening procedures to increase life expectancy.

*Conclusion:* The development of mathematical models in health care is useful in the process of improving health care quality. In our days, the measurement and quantification of some medical methods is particularly difficult due to so many variables and observations. In these difficult circumstances, the mathematical models could bring some clarifications and structure.

**Key words:** mathematical models, health care policy, life expectancy, screening procedures, breast cancer, partial and total surgical interventions, statistical analysis of indicators, random effect model-panel EGLS, COVID-19 pandemic