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Forecasting National Non-Communicable Disease Mortality Using Machine Learning: An Ecological Study of Predictive Factors

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Abstract

In this study, we built and validated a machine learning model capable of predicting national NCD mortality rates three years ahead with strong accuracy. The findings offer two major insights. First, the most predictive factors are recent, measurable health behaviours—specifically alcohol consumption and smoking prevalence.

Second, a condition's direction of change can be more revealing than its static value; the fact that the 3-year obesity trend outperformed the 1-year lag implies that the pace of the obesity crisis is a key early warning indicator.Our findings highlight the value of machine learning as a practical tool for global health forecasting. However, the study has limitations. Chief among them is its ecological design—results reflect population-level trends and cannot be applied to individuals.

In addition, although our feature engineering strategy was well grounded, it represents just one of many potential methods.In summary, we show that with sufficient historical data on major risk factors, robust models can be developed to anticipate future public health outcomes. These predictive tools may allow health agencies and governments to detect high-risk countries sooner and deploy preventive strategies more efficiently.

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