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Combining Artificial Neural Networks, Routine Health Records and Suicide Risk Estimation

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Introduction

Every year $\sim$ 800,000 people die by suicide worldwide. The pathway to suicide is mediated by highly complex processes, integrating a large number of risk factor variables which are extensively dependent on one another. Unfortunately, suicide risk prediction has been a challenging problem for epidemiological studies and their application to practice.

Objectives and Approach

We aim at exploring the feasibility of using artificial neural networks (ANNs) based on routinely collected electronic health records (EHRs) to support the identification of those at high risk of suicide when in contact with health services. We used the Secure Anonymised Information Linkage Databank UK to extract those who died by suicide between 2001 and 2015 and identify controls. We extracted risk factors from primary and secondary care about mental health, injury, substance misuse, maltreatment, sleep disorders and prescriptions. We trained a simple ANN to differentiate between cases/controls to test the feasibility of this approach.

Results

A total of 2,604 suicide cases and 20 paired controls per case were used during 10x10 K-Fold repeated cross-validation. We obtained an error rate of 26.78% $\pm$ 1.46 differentiating between cases and controls. The distribution of controls was concentrated around estimated risks

Conclusion/Implications

The proposed method performed similar to other works based on specialized questionnaire data. Prescription of psychotropics, depression and anxiety, and self-harm were strongly linked with higher risks, followed by hospital admission and substance misuse. This is in keeping with known literature, providing evidence that the proposed approach is feasible.