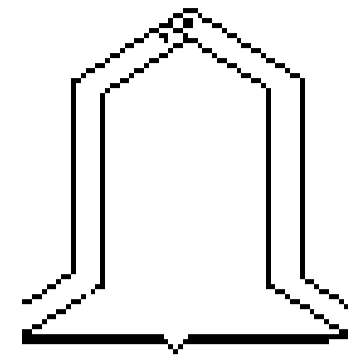


PREDICTING SUICIDAL BEHAVIOR OUTCOMES: AN ANALYSIS OF KEY FACTORS AND MACHINE LEARNING MODELS

Mohammad Bazrafshan¹ & Kourosh Sayehmiri^{2,6}
Ilam University of Medical Sciences, Ilam, Iran



INTRODUCTION

Suicidal behavior is a major global public health issue. Accurately predicting its outcome (survival vs. death) is critical for targeting prevention efforts.

This study aimed to:

- Identify key risk factors associated with suicide mortality
- Determine the most effective machine learning model to predict suicidal behavior outcomes

SIGNIFICANT RISK FACTORS

Factor	P-Value	Highest Risk Group
Age Group	<0.001	> 54 Years
Education	<0.001	Illiterate
Marital Status	0.004	Divorced/Widowed
Employment	0.042	Employed
Suicide Method	<0.001	Physical Methods
Reason	<0.001	Socioeconomic Problems

Non-Significant: Season, Gender, Parental Education

CONCLUSION & IMPLICATIONS

KEY FINDINGS

- Older age, lower education significant risk factors
- Physical methods 9.6x more lethal than chemical
- Socioeconomic problems strongly predictive

BEST MODEL

- Random Forest most effective predictor
- AUC: 0.79, Accuracy: 0.86

CLINICAL IMPACT

- Enables targeted interventions for high-risk groups
- Combines statistical and ML approaches
- Potential for real-time risk assessment tools

METHODOLOGY

STUDY DESIGN

Two-phase analysis of Suicidal Behavior Registry data

DATA SOURCE

- Initial Records: 8,090
- After Deduplication: 3,833 cases (130 suicides, 3,703 attempts)

PHASE 1: STATISTICAL ANALYSIS

- Identify significant factors
- Chi-square and Fisher's exact tests
- Significance: $P < 0.05$

PHASE 2: MACHINE LEARNING

- Algorithms: RF, LR, DT, KNN, SVM
- Process: Standardization, hyperparameter tuning
- Metrics: Accuracy, Precision, Recall, F1, AUC

MACHINE LEARNING PERFORMANCE

Random Forest - Best Performing Model

Metric	Score
AUC	0.79
Accuracy	0.86
Precision	0.21
F1 Score	0.31

Superior performance across all key metrics

ACKNOWLEDGEMENTS

This study was supported by Ilam University of Medical Sciences
Part of the first author's professional doctorate thesis
Ethics Code: IR.MEDILAM.REC.1401.179

Contact: kourosh8@gmail.com

Published in: BMC Psychiatry (2024)