

Supplementary Document 1

Finding Causal Impacts of Social Determinants of Mental Health on Opioid Use Disorder from Clinical Notes

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I. RECOGNIZED SOCIAL DETERMINANTS OF MENTAL HEALTH WITHIN CLINICAL NOTES USING NATURAL LANGUAGE PROCESSING: EXPERT IDENTIFICATION

| NLP-Extracted Parameters | Description | Prototype Tokens or Keywords |
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| Socially Detached (SD) | Recognizing the isolation experienced by individuals, the deficit of social engagement or support from relatives, and their matrimonial or partnership conditions. Identifying the paucity of social ties and the resultant strain on family networks | Alone, unaccompanied, reclusive, estranged, lonesome, desolate |
| Health Care Handover (HCH) | Shifts in healthcare management, including medication changes or healthcare personnel transitions; updates in patient status involving discharge procedures or patient transfer protocols. | Transfer, handover, treatment change, shift, care passage, service movement |
| Obstacles to Medical Care (OMC) | Barriers in effective communication, especially impacting individuals with cognitive impairments; transportation issues that limit access to medical services, and the lack of relational trust or connectivity with healthcare providers. | Accessibility hurdles, medical service barriers, entry obstacles, healthcare blockades, appointment difficulties, resource limitations |
| Financial Uncertainty (FU) | Facing monetary hurdles, experiencing barriers to stable employment, and enduring underprivileged economic states. | Financial insecurity, economic instability, monetary struggle, fiscal hardship, employment uncertainty, economic adversity |
| Residential Instability (RI) | Dealing with residential instability, grappling with concerns over stable shelter, and uncertainties surrounding living conditions. | Homelessness, eviction, housing instability, shelterlessness, residential instability, lodging insecurity |

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| Nutritional Shortage (NS) | Insufficient access to balanced and healthy food options, dependency on community support and social welfare for meeting basic dietary needs, and the necessity of utilizing emergency food services | Hunger, malnutrition, food deficit, nutritional lack, famine, undernourishment |
| Violence (V) | The existence or potential for violent encounters, experiencing or fearing severe mistreatment or aggression, the impact of discriminatory practices on personal security, and the psychological repercussions of violent thoughts or environments. | Violence, cruelty, viciousness, ferocity, harshness, abuse |
| Judicial Obstacles (JO) | The complexities of navigating legal systems, the repercussions of legal sanctions, the experience of being subject to judicial constraints, and the difficulties arising from legal disputes or criminal accusations. | Legal hurdles, prosecution, legal entanglements, court challenges, legal disputes, juridical complications |
| Substance Misuse (SMI) | The complications associated with excessive or illicit consumption of substances, the medical and social challenges of addiction, and the risks and consequences of acute intoxication leading to overdose. | Substance misuse, addiction, drug dependency, intoxication, overdose, chemical abuse |
| Mental Disturbance Symptoms (MDS) | Experiences of profound emotional distress, the social withdrawal associated with mental health issues, barriers to cognitive and emotional regulation, and the patterns that may lead to seeking psychiatric or psychological intervention. | Emotional distress, mental disorder, behavioral symptoms, psychological distress, mental disruption, affective disorder |
| Acute Pain (AP) | Intense and severe physical suffering that may require clinical attention and management, often indicative of a significant underlying health issue. | Torment, severe discomfort, throbbing, sharp pain, intense suffering, piercing agony |
| Medical Disability (MD) | The reliance on support due to medical disabilities, the impact of disabilities on one's quality of life and autonomy, and the role of medical aids in providing functional assistance. | Functional limitation, physical disability, cognitive impairment, sensory limitation, health disability, medical limitation |
| Suicide Mortality (SM) | Acts or considerations towards ending one's own life, including the mental states that precede such actions and the tragic outcomes of these considerations. | Self-harm, suicidal ideation, self-inflicted mortality, life-ending act, deliberate self-harm, existential despair |

II. RECOGNIZED NEGATIVE CONTROL DETERMINANTS WITHIN CLINICAL
NOTES: EXPERT IDENTIFICATION

| Negative Control Determinants (NCD) | Description | Prototype Tokens/Keywords |
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| Engagement in Healthy Activities (EHA) | Individuals who have tendencies to regularly participate in healthy activities of daily living or lifestyle choices, such as regular exercise, adequate sleep, healthy eating habits, and avoidance of harmful substances such as nicotine (smoking), and alcohol. | regular exercise, healthy diet, adequate sleep, non-smoker, alcohol-free, wellness. |
| Non-use or short-term use of prescription opioids (NSTOP) | Persons using prescription opioids transiently or for a brief period (i.e., less than 30 days) or who have never used prescription opioids in their lifetime. | opioid-free, short-term opioid use, limited opioid use, opioid abstinence, no opioid use. |