

# Commonly Diagnosed Mental Disorders in a General Hospital System

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## Research

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# Abstract

**Background:** Considering many patients seek care from general hospitals, these healthcare institutions are uniquely situated to address comorbid mental and physical health needs. Little is documented, however, on the most common mental disorders in patients seeking care in general hospital settings, especially in Puerto Rico. The objective of this study was to characterize the five most common DSM-5 mental disorder diagnoses made in a hospital system in southern Puerto Rico between January 2015 and December 2019.

**Methods:** A retrospective study of cross-sectional data obtained from 5,494 inpatients was implemented and a multinomial logistic regression was used to assess the odds of being diagnosed with a current mental disorder.

**Results:** Overall, 53% of the entire sample was diagnosed with a mental disorder during hospitalization. Major depressive, neurocognitive, anxiety, substance-related and schizophrenia-spectrum disorders were the most frequently diagnosed. Interestingly, females were 23% less likely to have been diagnosed with major depressive disorder than males ( $aOR: .769, CI [.650, .909], p = .002$ ). Thus, males evidenced 1.30 higher odds of being diagnosed with depression.

**Conclusion:** The integration of clinical health psychology services within a general hospital facilitated our team's work of identifying and treating co-occurring mental disorders among hospitalized patients. Future studies examining the opportunities and barriers of integrating clinical health psychology services within a general hospital's administrative and clinical infrastructure for rapid identification and treatment of co-occurring mental disorders among medical patients are warranted.

## 1. Introduction

Mental disorders are among the top causes of morbidity and account for approximately 14% of all deaths globally. Researchers have estimated that around 11% of the world's population currently lives with a mental disorder (Ritchie & Roser, 2018). Alarmingly, this estimate is higher in Puerto Rico, as revealed by findings from a recent behavioral health needs assessment conducted on the island. This assessment reported 12-month prevalence rates for any mental disorder to be approximately 24% among adults ages 18 to 64 (Canino et al., 2016). Moreover, Puerto Ricans with a serious mental illness make up 7.3% of the adult population. In addition, it is estimated that nearly half (43.1%) of Puerto Rican adults with some type of mental disorder are in need of mental healthcare services (Canino et al., 2016). These findings elucidate the magnitude of the mental health disparity crisis on the island, with inaccessible quality mental healthcare being a leading driver of such disparity (Wainberg et al., 2017; Knight 2011). Since 2008, there has been a consistent migratory stream from the island to the United States. Included in this efflux of people are specialty mental healthcare providers such as clinical psychologists and psychiatrists, which further worsens the conundrum of lack of access to quality mental healthcare services. Thus, there is an urgent need to address this. Considering many patients seek acute and emergent medical care from general hospitals, these healthcare institutions are uniquely situated to facilitate access to mental healthcare through rapid identification of comorbid mental conditions and initiate appropriate interventions. The current study's research team implemented a retrospective observational study of cross-sectional data to assess the most

frequently diagnosed mental disorders in a hospital system in southern Puerto Rico between 2015 and 2019. Major depressive disorder (MDD), neurocognitive disorder (NCD), anxiety disorders, substance-related, and schizophrenia spectrum disorders were the five most frequent diagnoses made. In the following sections, a brief overview of these disorders in relation to select biopsychosocial factors will be presented and a discussion of the implications of integrating clinical health psychology services within a general hospital system will be considered.

## **1.1 Major Depressive Disorders (MDD)**

Major depressive disorder (MDD) is a mood disorder that negatively impacts affective, cognitive, physiological, and behavioral systems. Hallmark features of MDD are sadness, inability to enjoy things that were once pleasurable, and a myriad of signs and symptoms ranging from lack of concentration and insomnia, to fluctuation in weight and changes in eating patterns. In the severest form, patients with MDD may evidence recurring thoughts of death, suicidal ideation, and even suicide attempts (American Psychiatric Association, 2013). A recent epidemiological study revealed that among non-institutionalized community members, MDD was slightly higher in Puerto Rican adults living on the island (9.9%) compared to the U.S. adult population (8.5%) (Canino et al., 2018). Traditionally, MDD rates are higher in females compared to males, 8.7% and 5.3%, respectively, and is most prevalent in people aged 18 to 25. (NIMH, 2019). Sociodemographic factors such as low educational attainment, economic instability, and lack of social support are implicated in the etiology and course of MDD (Assari, 2017).

## **1.2 Neurocognitive Disorders**

Neurocognitive Disorders (NCD) are a group of disorders that are characterized by significant clinical dysfunction in areas of complex attention, executive functioning, perpetual motor skills, social cognition, and emotional reaction. Such dysfunction is readily recognizable from premorbid functioning and unfolds in a progressive manner (American Psychiatric Association, 2013). Considering there are 10 million new cases of NCDs registered yearly, it is estimated that by 2030 there will be an alarming 82 million people suffering from a form of NCD worldwide (WHO, 2017). NCDs have been among the most prevalent causes of death in the world. While much less is known about the prevalence rates of NCD in Puerto Rico, researchers have estimated that 5% of adults who are 45 years of age and older report cognitive decline. Of those 5%, the vast majority (87%) of people with subjective cognitive decline have at least one chronic physical condition (CDC, 2019).

## **1.3 Anxiety Disorders**

It is estimated that anxiety disorders affect approximately 13% of Americans adults living in the United States and 12.5% of Puerto Rican adults on the island (Canino et al., 2019). Anxiety disorders share features of excessive fear and anxiety, inability to control anxious cognitions, and related behavioral disturbances (APA, 2013). Patients diagnosed with these disorders commonly exhibit physiological symptoms such as sweating, trembling, dizziness and rapid heartbeat, and cognitive and behavioral symptoms spanning intrusive thoughts, worries, and avoidance tendencies (APA, 2013).

## **1.4 Substance-related and Addictive Disorders**

The DSM-5 has categorized substance-related disorders into 10 different drug categories: alcohol, caffeine, cannabis, hallucinogens, inhalants, opioids, sedatives, hypnotics, anxiolytics, stimulants, and other substances (APA, 2013). These disorders are further divided into substance use disorders and substance-induced disorders which include intoxication, withdrawal, and other substance/medication-induced mental disorders.

### **1.5 Schizophrenia Spectrum and Other Psychotic Disorders**

Schizophrenia spectrum disorders are classified into 12 distinct mental conditions that are considered serious mental illnesses with signs and symptoms spanning one or more of five established domains: (a) delusional thought, (b) sensory-perceptual hallucinations, (c) grossly disorganized speech, (d) psychomotor disturbances, and (e) negative signs and symptoms such as blunted or flat affect, avolition, and anhedonia. (APA, 2013). Of all the psychotic disorders, schizophrenia is by far the most studied, and has amassed a substantial evidence base. Among non-institutionalized community members, lifetime prevalence of schizophrenia ranges from 0.3–0.7%, with little variance between biological sex.

## **2 Methods**

The research team conducted a retrospective study examining cross-sectional biopsychosocial variables obtained from inpatients of a general hospital in Ponce, Puerto Rico that were hospitalized between January 2015 and December 2019.

### **2.1 Participants**

Participants were inpatients of Damas Hospital that received a standardized clinical interview during their hospital stay. All patients gave informed consent for data collection and the Institutional Review Board of the Ponce Research Institute approved this study. Every author certifies that the study was performed in accordance with the ethical standards, as set by the 1964 Declaration of Helsinki and its later amendments.

### **2.2 Procedures**

**2.2.1 Clinical Team.** The Clinical Psychology Services Program (CPSP) of Ponce Health Sciences University provides clinical health psychology services that include screenings, standardized clinical evaluations, brief psychotherapy, psychophysiological interventions, neuropsychological rehabilitation, and consultation-liaison services in general hospital settings across the southern region of Puerto Rico. The CPSP have established agreements with affiliate hospitals where standing orders are in place for select hospital units. Standing orders entail the administration of routine standardized clinical evaluations for all patients admitted to the following units: (a) cardiovascular surgery, (b) coronary care, (c) intensive care, and (d) skilled nursing units. Additionally, the clinical team provided clinical health psychology consults as requested by attending physicians, regardless of the inpatient unit to which the patient was admitted. For this present study, the research team analyzed sociodemographic and psychosocial data, ICD-10 medical diagnoses, and DSM-5 mental disorder diagnoses the CPSP clinical team obtained during the standardized clinical evaluation.

**2.2.2 Standardized Clinical Evaluation.** The standardized clinical evaluation entailed a mental status examination, exploration of psychological and emotional symptoms, a review of past physical and mental illness history, and a review of social functioning. Clinical inventories such as the Mini Mental Status Exam (Folstein et al., 1975), Beck Depression Inventory-II (Beck, et al., 1996), and Beck Anxiety Inventory (Beck et al., 1988) were used to aid in the exploration of mental status and psychological-emotional symptomology. Additionally, a review of laboratory results, medications, and physician and nurse progress notes was conducted to aid in ruling out organic causes of possible mental aberrations. The CPSP clinical team performed the standardized clinical evaluation at the patient's bedside. If warranted, the clinical team made a DSM-5 diagnosis and corresponding brief treatment plan for the duration of the patient's hospital stay.

## 2.3 Measures

**2.3.1 Sociodemographic, Medical Diagnosis, and Past Mental Health History.** Questionnaires generated by the clinical team were used to collect the following biopsychosocial variables: age, biological sex, civil status, level of education, employment status, and annual median household income. Past history of mental disorder and history of substance use/abuse variables were also included in the study. ICD-10 medical diagnoses were obtained from chart reviews performed by the CPSP clinical team.

## 2.4 Inclusion Criteria

**2.4.1 DSM-5 diagnoses.** Patients diagnosed with depressive, neurocognitive, anxiety, substance-related, and addictive and schizophrenia spectrum disorders according to DSM-5 criteria were included in the study. Additionally, those who did not meet DSM-5 criteria for a diagnosis during hospitalization were included as a comparison group.

**2.4.2 Age.** Inpatients that were 21 years of age or older were included in the study.

## 2.5 Data Analysis

SPSS 27 (IBM Corp) was used to perform data analysis. Data preparation and exploration procedures were conducted, and data was examined for errors and quality. Missing data analysis was conducted, and missing variables were replaced with multiple imputation linear regression method (Salgado, Azevedo, Proen  a & Vieira, 2016). All missing data in this dataset were less than 5%. Descriptive statistics were performed to assess measures of central tendencies, standard deviation, and confidence intervals. Chi-square tests of independence were conducted to assess associations between the top five diagnosed mental disorders and select sociodemographic indicators. Multinomial logistic regressions were conducted to evaluate the odds of being diagnosed with a DSM-5 depressive, neurocognitive, anxiety, substance-related, or schizophrenia spectrum disorder compared to no disorder among inpatients. The Benjamini-Hockberg procedure (Benjamini & Hockberg, 1995) was applied to control for false discovery rates due to multiple comparisons in the adjusted multinomial logistic regression model.

# 3 Results

Data from a total of 5,494 inpatients was analyzed. The mean age of this patient sample was 62.2 years, 95% CI [61.75, 62.65]. There were more females (57.8%) than males and the majority of patients were unmarried (53.2%). Additionally, 83.6% were unemployed and 26% reported having obtained less than a high

school education. Overall, more than half (53%) of the entire sample was diagnosed with a current DSM-5 mental disorder during hospitalization. Major depressive disorders accounted for 42%, neurocognitive (33%), anxiety (11%), substance-related (8%), and schizophrenia spectrum (6%) of the five most frequently diagnoses made by the CPSP clinical team. Routine standardized clinical evaluations accounted for 84% of all DSM-5 diagnoses made and the remaining 16% were made from physician or patient requested consults. Moreover, the two most common diagnoses resulting from routine standardized clinical interviews were neurocognitive and major depressive disorders, accounting for 20% and 19%, respectively. Diagnoses made from consults, however, consisted primarily of major depressive disorders (37%), followed by substance use disorders (9%). Further, 97% of all patients evidenced a chronic physical condition. Ninety-nine per cent (99.4%) of male patients had a chronic physical condition compared to 95% of female patients. Fifty-nine percent (59%) of male patients had comorbid mental and physical conditions compared to 48% of females.

Table 1  
Profile of Sociodemographic, Previous Mental Disorder History and Chronic Co-morbid Physical Illness

(n = 5494)	Major Depressive Disorder (n = 1214)	Neurocognitive (n = 995)	Anxiety (n = 314)	Substance-related (n = 217)	Schizophrenia spectrum (n = 173)	No DSM-5 Diagnosis (n = 2581)
<b>Mean [95% CI]</b>						
Age (years)	57.63 [56.68, 58.58]	73.41 [72.64, 74.17]	56.90 [54.94, 58.86]	51.71 [49.45, 53.97]	49.83 [47.23, 52.64]	62.30 [61.66, 62.94]
<b>Frequency (% within mental disorder category)</b>						
<b>Biological Sex</b>						
Female	722 (59.5) [56.68, 58.58]	492 (49.4) [72.64, 74.17]	199 (63.4) [54.94, 58.86]	41 (18.9) [49.45, 53.97]	81 (46.8) [47.23, 52.64]	1640 (63.5) [61.66, 62.94]
Male	492 (40.5) [56.68, 58.58]	503 (50.6) [72.64, 74.17]	115 (36.6) [54.94, 58.86]	176 (81.1) [49.45, 53.97]	92 (53.2) [47.23, 52.64]	941 (36.5) [61.66, 62.94]
<b>Civil Status</b>						
Not Married	734 (60.5) [56.68, 58.58]	521 (52.4) [72.64, 74.17]	164 (52.2) [54.94, 58.86]	153 (70.5) [49.45, 53.97]	135 (78.0) [47.23, 52.64]	1217 (47.2) [61.66, 62.94]
Married	480 (39.5) [56.68, 58.58]	474 (47.6) [72.64, 74.17]	150 (47.8) [54.94, 58.86]	64 (29.5) [49.45, 53.97]	38 (22.0) [47.23, 52.64]	1364 (52.8) [61.66, 62.94]
<b>Education Level</b>						
No formal education	17 (1.4) [56.68, 58.58]	27 (2.7) [72.64, 74.17]	4 (1.3) [54.94, 58.86]	2 (0.9) [49.45, 53.97]	2 (1.2) [47.23, 52.64]	41 (1.6) [61.66, 62.94]
Less than high school	268 (22.1) [56.68, 58.58]	323 (32.5) [72.64, 74.17]	62 (19.7) [54.94, 58.86]	55 (25.3) [49.45, 53.97]	48 (27.7) [47.23, 52.64]	592 (22.9) [61.66, 62.94]
High school	508 (41.8) [56.68, 58.58]	375 (37.7) [72.64, 74.17]	123 (39.2) [54.94, 58.86]	111 (51.2) [49.45, 53.97]	81 (46.8) [47.23, 52.64]	983 (38.1) [61.66, 62.94]
Postsecondary and beyond	421 (34.7) [56.68, 58.58]	270 (27.1) [72.64, 74.17]	125 (39.8) [54.94, 58.86]	49 (22.6) [49.45, 53.97]	42 (24.3) [47.23, 52.64]	965 (37.4) [61.66, 62.94]
<b>Employment Status</b>						
Not employed	1044 (86.0) [56.68, 58.58]	921 (92.6) [72.64, 74.17]	234 (74.5) [54.94, 58.86]	168 (77.4) [49.45, 53.97]	159 (91.9) [47.23, 52.64]	2067 (80.1) [61.66, 62.94]
Employed	170 (14.0) [56.68, 58.58]	74 (7.4) [72.64, 74.17]	80 (25.5) [54.94, 58.86]	49 (22.6) [49.45, 53.97]	14 (8.1) [47.23, 52.64]	514 (19.9) [61.66, 62.94]
<b>Monthly Household Income</b>						
≤ \$300	221 (18.2) [56.68, 58.58]	130 (13.1) [72.64, 74.17]	29 (9.2) [54.94, 58.86]	54 (24.9) [49.45, 53.97]	48 (27.7) [47.23, 52.64]	250 (9.7) [61.66, 62.94]

(n = 5494)	Major Depressive Disorder (n = 1214)	Neurocognitive (n = 995)	Anxiety (n = 314)	Substance-related (n = 217)	Schizophrenia spectrum (n = 173)	No DSM-5 Diagnosis (n = 2581)
\$301 - \$900	462 (38.1)	403 (40.5)	131 (41.7)	82 (37.8)	83 (48.0)	930 (36.0)
\$901 - \$1500	310 (25.5)	269 (27.0)	79 (25.2)	46 (21.2)	27 (15.6)	726 (28.1)
\$1501 - \$2100	107 (8.8)	96 (9.6)	35 (11.1)	20 (9.2)	8 (4.6)	336 (13.0)
≥ \$2100	114 (9.4)	97 (9.7)	40 (12.7)	15 (6.9)	7 (4.0)	339 (13.1)
<b>History of Substance Use/Abuse</b>						
Positive history	391 (32.2)	238 (23.9)	87 (27.7)	196 (90.3)	68 (39.3)	568 (22.0)
Negative history	823 (67.8)	757 (76.1)	227 (72.3)	21 (9.7)	105 (60.7)	2013 (78.0)
<b>Previous Mental Disorder</b>						
Recurring mental disorder	774 (63.8)	225 (22.6)	159 (50.6)	102 (47.0)	152 (87.9)	459 (17.8)
No recurring mental disorder	440 (36.2)	770 (77.4)	155 (49.4)	115 (53.0)	21 (12.1)	2122 (82.2)
<b>Chronic Co-morbid Physical Illness</b>						
Cardiovascular Disease	291 (24.0)	198 (19.9)	84 (26.8)	40 (18.4)	10 (5.8)	689 (26.7)
Orthopedic	77 (6.3)	110 (11.1)	34 (10.8)	16 (7.4)	1 (0.6)	485 (18.8)
Respiratory	96 (7.9)	110 (11.1)	34 (10.8)	9 (4.1)	10 (5.8)	123 (4.8)
Gastrointestinal	74 (6.1)	76 (7.6)	22 (7.0)	17 (7.8)	8 (4.6)	155 (6.0)
Cancer (unspecified)	38 (3.1)	17 (1.7)	10 (3.2)	6 (2.8)	2 (1.2)	146 (5.7)
Other	632 (52.1)	482 (48.4)	129 (41.1)	128 (59.0)	142 (82.0)	830 (32.2)
No diagnosis	6 (0.5)	2 (0.2)	1 (0.3)	1 (0.5)	0	153 (5.9)

### 3.1 Specific DSM-5 Diagnoses

Among major depressive disorders diagnoses (MDD), recurrent episodes (70%) were most frequently diagnosed and recurrent episodes with psychotic characteristics (6.9%), the least frequent. Within neurocognitive disorders (NCD), delirium due to another medical condition (24.8%) was most commonly diagnosed and unspecified delirium (6.8%) the least common. Generalized anxiety disorder (72.5%) was the most frequently diagnosed anxiety disorder and alcohol use disorder (48%) the most frequently diagnosed substance-related disorder. Schizophrenia and brief psychotic disorder were the most and least common diagnosed within the schizophrenia spectrum disorders, 34.6% and 6.7%, respectively.

### **3.2 Comorbid Chronic Physical Conditions and Diagnosed Mental Disorders**

Among patients diagnosed with major depressive disorders, slightly more than one in five patients (21.4%) also lived with a co-occurring cardiovascular disease. The least frequent co-occurring chronic physical disease among patients with depressive disorders was immunologic disease, accounting for 0.2% of all ICD-10 diagnoses among this patient group. Chronic neurological diseases were the most common co-occurring physical conditions among patients diagnosed with a DSM-5 neurocognitive condition (22%), and chronic endocrine disorders (1%) were the least common. Slightly more than one out of every four patients (27%) diagnosed with an anxiety disorder also had a co-occurring cardiovascular disease. Chronic immunologic disorders were least common among this group of patients, accounting for 0.3% of ICD-10 diagnoses. Similarly, patients diagnosed with a substance-related disorder had higher cardiovascular disease comorbidity (18%) than any other chronic physical condition. Lastly, among patients diagnosed with a schizophrenia spectrum disorder, 5.8% also lived with a co-occurring cardiovascular disease.

Table 2  
Specific DSM-5 Diagnoses

	Frequency	% (within DSM-5 Category)
<b>Major Depressive Disorders (MDD) (n = 1214)</b>		
MDD, Recurrent Episode	855	70.4
MDD, Single Episode	122	10.1
MDD, recurrent with psychotic characteristics	84	6.9
Other	153	12.6
<b>Neurocognitive Disorders (NCD) (n = 995)</b>		
Delirium due to another medical condition	247	24.7
Unspecified NCD	148	14.8
Delirium due to multiple etiologies	92	9.3
Mild NCD due to vascular disease	80	8.0
Unspecified Delirium	68	6.8
Other	360	36.2
<b>Anxiety Disorders (n = 314)</b>		
Generalized Anxiety Disorder (GAD)	228	72.5
Panic Disorder	54	17.2
Other	32	10.1
<b>Substance-Related (n = 217)</b>		
Alcohol Use Disorder	104	48.0
Tobacco Use Disorder	93	42.8
Other	20	9.2
<b>Schizophrenia Spectrum (n = 173)</b>		
Schizophrenia	60	34.6
Unspecified Schizophrenia Spectrum and Other Psychotic Disorder	36	20.7
Brief Psychotic Disorder	11	6.7
Other	66	38.0

### 3.3 Biological Sex Predicts Mental Disorder Diagnoses in a General Hospital Setting

An unadjusted multinomial logistic regression model revealed that biological sex differentially predicted being diagnosed with a current mental disorder during hospitalization. The overall model was significant  $\chi^2(5) = 215.659$ ,  $p < .001$ , and biological sex accounted for 4.1% of the variance found within the mental disorder diagnosis categories (Nagelkerke pseudo  $R^2 = .041$ ). Overall, male patients had higher odds of being diagnosed with a current DSM-5 diagnosis compared to females. However, being diagnosed with an anxiety disorder was not significantly predicted by biological sex. Female patients were 15.7% less likely to be diagnosed with MDD compared to male (OR: .842, 95% CI [.732, .968],  $p = .01$ ). This finding suggests that males were 1.18 times more likely to have been diagnosed with an MDD than females. Moreover, males evidenced 1.78 higher odds of being diagnosed with a form of NCD compared to females (OR: .561, CI [.484, .651],  $p < .001$ ). Male patients also evidenced much higher odds (7.46) of being diagnosed with a substance related disorder compared to females (OR: .134, CI [.094, .190],  $p < .001$ ). Lastly, female patients were 49.5% less likely to be diagnosed with a schizophrenia spectrum disorder than males (OR: .505, CI [.371, .688],  $p < .001$ ). This is to say male patients evidenced 1.98 higher odds of being diagnosed with a schizophrenia spectrum disorder during hospitalization.

### **3.4 Adjusted Multinomial Model**

The overall adjusted model was significant  $\chi^2(70) = 2463.171$ ,  $p < .001$ , with predictor variables accounting for 38.5% of the variance found within the DSM-5 diagnosis categories (Nagelkerke pseudo  $R^2 = .385$ ). Reference Table 3 for adjusted multinomial logistic regression values.

#### **3.4.1 Major Depressive Disorders**

Overall, age, biological sex, civil status, employment status, monthly household income, previous mental disorder and history substance use/abuse history was significantly associated with receiving a current DSM-5 major depressive disorder diagnosis. For each one-year increase in age, patients evidenced a 1% less chance of being diagnosed with MDD (OR: .990, CI [.985, .995]). Females evidenced 23% lower odds of being diagnosed compared to males (OR: .769, CI [.650, .909]). Thus, males had 1.30 higher odds of being diagnosed with a depressive disorder. Compared to married patients, the ones who reported being unmarried were 1.41 times more likely to have been diagnosed (OR: 1.41, CI [1.20, 1.65]). Those who reported having a monthly household income of  $\$ \leq 300$  had 2.12 higher odds of being diagnosed compared to patients reporting a household income  $\geq \$2101$  per month (OR: 2.12, CI [1.53, 2.94]). Patients with previous mental disorders evidenced 7.62 higher odds of being diagnosed with a current depressive disorder compared to patients without a previously diagnosed mental disorder (OR: 7.62, CI [6.50, 8.95]). Lastly, patients with a past history of substance use/abuse evidenced 1.23 higher odds of being diagnosed with depression compared to those with no history of substance use/abuse (OR: 1.23, CI [1.03, 1.48]). Level of education was not significantly associated with receiving a depressive disorder diagnosis. After adjusting for multiple comparisons, only age, biological sex, civil status, employment status, monthly household incomes of  $\leq \$300$ , and previous mental disorder remained significant predictors of being diagnosed with a current MDD.

#### **3.4.2 Neurocognitive Disorders**

For every one-year increase in age, the odds of being diagnosed with a current neurocognitive disorder was relatively similar (OR: 1.058, CI [1.051, 1.065]). Female patients evidenced 45% lower odds of being

diagnosed compared to males (OR: .54, CI [.46, .64]). Conversely, males had 1.82 higher odds than females of being diagnosed with a current neurocognitive disorder. Unmarried patients were 1.27 times more likely to have received a current diagnosis compared to married patients (OR: 1.27, CI [1.08, 1.49]). Those who reported a monthly household income  $\leq$  \$300 evidenced 1.75 higher odds of being diagnosed compared to patients with incomes  $\geq$  \$2101 per month (OR: 1.75, CI [1.25, 2.46]). Patients with a previous mental disorder had 1.90 higher odds of receiving a neurocognitive diagnosis compared to patients without a previous illness (OR: 1.90, CI [1.57, 2.31]). Employment status, level of education, and history of substance use/abuse did not significantly predict being diagnosed with a DSM-5 neurocognitive disorder. Further, after adjusting for multiple comparisons, all sociodemographic and previous mental disorders remained significant.

### **3.4.3 Anxiety Disorders**

Only age and recurring illness was significantly associated with being diagnosed with a current anxiety condition. For every one-year increase in age, patients had 0.2% lower odds of being diagnosed (OR: .989, CI [.981, .997]). Having a previous mental disorder was related to 4.46 higher odds of receiving a current diagnosis (OR: 4.46, CI [3.47, 5.72]). Both age and previous mental disorder remained significant predictors after adjusting for multiple comparisons.

### **3.4.4 Substance-related Disorders**

Each year increase in age was associated with 2.9% lower odds of being diagnosed with a current substance-related disorder (OR: .97, CI [.96, .98]). Female patients evidenced 73.2% lower odds of being diagnosed compared to males (OR: .26, CI [.18, .39]). Conversely, males evidenced 3.73 higher odds of being diagnosed with a substance-related disorder. Unmarried patients evidenced 1.90 higher odds of receiving a diagnosis compared to married patients (OR: 1.90, CI [1.34, 2.68]). Those who reported monthly household incomes of  $\leq$  \$300 were 2.76 times more likely to have been diagnosed compared to those with a monthly income of  $\geq$  \$2101 (OR: 2.76, CI [1.40, 5.44]). Having a previous mental disorder predicted 2.86 higher odds of receiving a current diagnosis compared to not having a previous illness (OR: 2.86, CI [2.06, 3.97]). Lastly, those with a history of substance use/abuse were 16.98 times more likely to have been diagnosed with a current substance-related disorder compared to patients without substance use/abuse history (OR: 16.98, CI [10.48, 27.49]). Level of education and employment were not significant predictors of receiving a current DSM-5 substance-related diagnosis. All predictors remained significant after adjusting for multiple comparisons.

### **3.4.5 Schizophrenia Spectrum Disorders**

Each one-year increase in age was associated with 2.8% less odds of being diagnosed with a current schizophrenia spectrum disorder (OR: .97, CI [.96, .98]). Female patients were 60% less likely to have been diagnosed compared to males (OR: .39, CI [.27, .56]). Thus, male patients evidenced 2.53 higher odds of being diagnosed with a schizophrenia spectrum disorder compared to females. Unmarried patients were 2.49 odds more likely to have been diagnosed compared to married patients (OR: 2.49, CI [1.66, 3.73]). Those with less than high school education evidenced 2.13 higher odds of being diagnosed (OR: 2.13, CI [1.31, 3.47]) compared to patients with postsecondary education attainment or beyond. Patients with monthly household incomes of  $\leq$  \$300 and \$301-\$900 had 4.28 and 3.05 higher odds, respectively, of being diagnosed compared to those with household incomes  $\geq$  \$ 2101 per month. Patients with a past history of mental disorders had 30.16 higher odds of receiving a diagnosis than patients without past mental disorder histories

(OR = 30.20, CI [18.67, 48.72]). All predictors except less than high school education attainment and monthly household income of \$301-\$900 remained significant after adjusting for multiple comparisons.

Table 3  
Adjusted Multinomial Logistic Regression

	B	S.E.	Wald $\chi^2$	p	OR	95% Confidence Interval	
						Upper	Lower
<b>Major Depressive Disorders</b>							
Intercept	-1.724	.211	66.951	< .001			
Age (years)	-.010	.003	14.326	< .001	.99	.98	.99
Female <sup>a</sup>	-.263	.086	9.431	.002	.76	.65	.909
Unmarried <sup>b</sup>	.346	.080	18.617	< .001	1.41	1.20	1.65
Not employed <sup>c</sup>	.426	.117	13.331	< .001	1.53	1.21	1.92
No formal education <sup>d</sup>	.141	.316	.199	.65	1.15	.62	2.13
< High school <sup>d</sup>	.098	.111	.783	.37	1.10	.88	1.37
High school <sup>d</sup>	.069	.092	.562	.453	1.07	.89	1.28
≤ \$300 <sup>e</sup>	.755	.165	20.912	< .001	2.12	1.53	2.94
\$301 -\$900 <sup>e</sup>	.313	.140	4.964	.02	1.36	1.03	1.79
\$901-\$1500 <sup>e</sup>	.211	.142	2.209	.13	1.23	.93	1.63
\$1501-\$2100 <sup>e</sup>	-.025	.169	.022	.88	.97	.70	1.35
Previous mental disorder	2.032	.082	620.783	< .001	7.62	6.50	8.95
Substance use/abuse history <sup>g</sup>	.211	.092	5.248	.02	1.23	1.03	1.48
<b>Neurocognitive Disorders</b>							
Intercept	-5.177	.279	344.717	< .001			
Age (years)	.056	.003	259.377	< .001	1.051	1.058	1.065
Female <sup>a</sup>	-.601	.086	49.125	< .001	.54	.46	.64
Unmarried <sup>b</sup>	.239	.082	8.504	.004	1.27	1.08	1.49
Not employed <sup>c</sup>	.247	.145	2.886	.08	1.28	.96	1.70
No formal education <sup>d</sup>	.162	.275	.349	.55	1.17	.68	2.01
< High school <sup>d</sup>	.134	.108	1.544	.21	1.14	.92	1.41

							<b>95% Confidence Interval</b>
High school <sup>d</sup>	.103	.099	1.086	.29	1.10	.91	1.34
≤ \$300 <sup>e</sup>	.563	.174	10.511	.001	1.75	1.25	2.46
\$301-\$900 <sup>e</sup>	.240	.144	2.791	.09	1.27	.95	1.68
\$901-\$1500 <sup>e</sup>	.100	.146	.470	.49	1.10	.83	1.47
\$1501-\$2100	-.028	.173	.027	.87	.97	.69	1.36
Previous mental disorder	.646	.098	43.326	< .001	1.90	1.57	2.31
Substance use/abuse history <sup>g</sup>	-.070	.098	.510	.47	.933	.770	1.12
<b>Anxiety Disorders</b>							
Intercept	-1.899	.313	36.860	< .001			
Age (years)	-.012	.004	8.235	.004	.989	.981	.997
Female <sup>a</sup>	-.088	.138	.410	.52	.91	.69	1.19
Unmarried <sup>b</sup>	.055	.127	.189	.66	1.05	.82	1.35
Not employed <sup>c</sup>	-.209	.162	1.654	.19	.81	.59	1.11
No formal education <sup>d</sup>	.053	.544	.010	.92	1.05	.36	3.06
< High school <sup>d</sup>	.052	.182	.082	.77	1.05	.73	1.50
High school <sup>d</sup>	.026	.145	.032	.85	1.02	.77	1.36
≤ \$300 <sup>e</sup>	.051	.277	.034	.85	1.05	.61	1.81
\$301-\$900 <sup>e</sup>	.304	.208	2.131	.14	1.35	.90	2.03
\$901-\$1500 <sup>e</sup>	.033	.214	.023	.87	1.03	.67	1.57
\$1501-\$2100 <sup>e</sup>	-.048	.250	.037	.84	.95	.58	1.55
Previous mental disorder <sup>f</sup>	1.495	.127	138.713	< .001	4.46	3.47	5.72
Substance use/abuse history <sup>g</sup>	.154	.148	1.083	.29	1.16	.873	1.55
<b>Substance-related Disorders</b>							
Intercept	-3.447	.490	49.526	< .001			

	95% Confidence Interval						
Age (years)	-.029	.005	31.886	<.001	.97	.96	.98
Female <sup>a</sup>	-1.317	.197	44.755	<.001	.26	.18	.39
Unmarried <sup>b</sup>	.643	.176	13.280	<.001	1.90	1.34	2.68
Not employed <sup>c</sup>	-.001	.204	.000	.99	.99	.67	1.49
No formal Education <sup>d</sup>	-.279	.793	.124	.72	.75	.16	3.57
< High school <sup>d</sup>	.356	.235	2.294	.13	1.42	.90	2.26
High school <sup>d</sup>	.387	.197	3.879	.04	1.47	1.00	2.16
≤ \$300 <sup>e</sup>	1.016	.346	8.605	.003	2.76	1.40	5.44
\$301-\$900 <sup>e</sup>	.584	.314	3.471	.06	1.79	.97	3.31
\$901-\$1500 <sup>e</sup>	.417	.326	1.631	.20	1.51	.80	2.87
\$1501-\$2100 <sup>e</sup>	.396	.373	1.123	.28	1.48	.71	3.08
Previous mental disorder <sup>f</sup>	1.053	.167	39.982	<.001	2.86	2.06	3.97
Substance use/abuse history <sup>g</sup>	2.832	.246	132.657	<.001	16.98	10.48	27.49
<b>Schizophrenia Spectrum Disorders</b>							
Intercept	-5.054	.598	71.347	<.001			
Age (years)	-.028	.005	27.363	<.001	.97	.96	.98
Female <sup>a</sup>	-.929	.181	26.251	<.001	.39	.27	.56
Unmarried <sup>b</sup>	.914	.205	19.835	<.001	2.49	1.66	3.73
Not employed <sup>c</sup>	.959	.311	9.510	.002	2.60	1.41	4.79
No formal Education <sup>d</sup>	.512	.781	.430	.51	1.66	.36	7.71
< High school <sup>d</sup>	.758	.248	9.331	.002	2.13	1.31	3.47
High school <sup>d</sup>	.400	.213	3.531	.06	1.49	.98	2.26
≤ \$300 <sup>e</sup>	1.454	.444	10.722	.001	4.28	1.79	10.22
\$301-\$90 <sup>e</sup>	1.107	.419	6.983	.008	3.02	1.33	6.87

							<b>95% Confidence Interval</b>
\$901-\$1500 <sup>e</sup>	.382	.444	.738	.39	1.46	.61	3.49
\$1501-\$2100 <sup>e</sup>	.090	.540	.028	.86	1.09	.38	3.15
Previous mental disorder <sup>f</sup>	3.407	.245	194.018	< .001	30.16	18.67	48.72
Substance use/abuse history <sup>g</sup>	.032	.189	.029	.86	1.033	.712	1.49

\*Reference category for DSM-5 diagnoses is No current DSM-5 mental disorders.

<sup>a</sup>Male is reference category.

<sup>b</sup>Married is reference category.

<sup>c</sup>Employed is reference category.

<sup>d</sup>Postsecondary education and beyond is reference category.

<sup>e</sup>≥ \$2101 monthly household income is reference category.

<sup>f</sup>No previous mental disorder history is reference category.

<sup>g</sup>Negative substance use/abuse history is reference category.

## 4 Discussion

After controlling for covariate predictors in the multinomial model, spurious associations were discovered among anxiety, substance-related, and schizophrenia spectrum disorders. Predictors of major depressive and neurocognitive disorders, however, not only maintained predictive ability, but increased in odds ratio from the unadjusted models. Thus, the following discussion will highlight select clinical implications regarding major depressive and neurocognitive disorders diagnosed in inpatients of a general hospital.

### 4.1 Major Depressive Disorders

Traditionally, females are disproportionately affected by MDD (NIMH, 2019; Labaka et al., 2018; Albert, 2015; Picco, 2017). However, this was not the case in a general hospital setting. Male patients evidenced 1.30 higher odds of being diagnosed with a major depressive disorder compared to females. At least two plausible explanations can account for this finding. First, in this setting where evaluations and diagnoses were made (a general hospital), both males and females were equally likely to have received a psychological evaluation and subsequent diagnosis, if warranted. Yet, this is not the case in community and outpatient settings, where females are more likely to seek mental healthcare services than males (Thompson et al., 2016; Menbreu et al., 2018; Smith et al., 2013). It begs the question if higher MDD prevalence rates among women are a

function of healthcare-seeking behavior or due to actual biological sex-related difference in development and course of depression. Secondly, considering that male patients evidenced higher proportions of mental and physical illness comorbidities than females, 59% and 48%, respectively, it is plausible that males engaged in less adaptive coping mechanisms in managing their conditions, leading to depressive affect and subsequent diagnosis during hospitalization. Nevertheless, this does not fully explain why male patients evidenced higher odds of being diagnosed with MDD during hospitalization compared to females. Future studies are warranted in exploring sex-related differences in mental healthcare-seeking behaviors and differences in sex-related coping mechanisms employed in managing chronic physical conditions.

#### **4.2 Neurocognitive Disorders**

As expected, older age was related to a current NCD, specifically, delirium diagnosis during hospitalization, where each one-year increase in age was associated with 1.05 higher odds of receiving an NCD diagnosis. Delirium disorders are common among elderly patients admitted to general hospitals, with estimates ranging from 14–56% of all elderly patients being affected during hospital stay (Fong et al., 2009; APA, 2013). Interestingly, in this present study, unlike major depressive disorders, NCDs were diagnosed more as a result of routine evaluations compared to referrals by attending physicians, suggesting that if it had not been for routine the evaluations in place, rapid identification of an NCD and initiation of appropriate psychosocial interventions would have possibly been forfeited.

#### **4.3 Key Implications**

The vast majority (90%) of patients that were diagnosed with MDD and 87% that were diagnosed with NCD received an evaluation within 24 hours of being admitted to corresponding hospital units or after physician referral. Swift detection of current mental disorder during hospitalization and initiation of appropriate interventions is largely due to the integration of clinical health psychology services within a general hospital care delivery model. Having a clinical health psychology team embedded within the care delivery model of a general hospital system requires integration at the administrative and clinical care levels. The specific integrative model on which the CPSP clinical team operates has been detailed elsewhere (Jiménez et al., 2013).

#### **4.4 Strengths, Limitations, and Future Work**

While the results from this study cannot support a causative link between sociodemographic factors, previous psychiatric history, and current mental disorder diagnosis, the relatively large sample size and applied research approach allow these findings to be generalized outside of this sample of patients. A possible limitation, however, is the lack of psychological symptom indicators and patient follow-up post hospital discharge. Thus, future work regarding the benefits, limitations, and outcomes surrounding continuation of care post discharge is needed.

### **5 Conclusion**

Major depressive, neurocognitive, anxiety, substance use, and schizophrenia-spectrum disorders were the five most commonly made DSM-5 diagnoses in a general hospital system. Male patients were 1.30 times more likely to have been diagnosed with major depressive disorder compared to females, and delirium was the most common form of NCD among both males and females. The importance of implementing clinical health

psychology services within the administrative and clinical structure of general hospitals was considered and future work concerning continuation of psychological care post discharge, exploration of sex-related differences in mental healthcare seeking behaviors, and sex-related differences in coping with chronic physical illness is encouraged.

## Declarations

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### Compliance with Ethical Standards

Research involving human participants.

**Ethical approval:** All procedures performed in this study were in accordance with the ethical standards of the Ethics Committee of the Ponce Research Institute and adhere to the tenants of the 1964 Helsinki Declaration and its later amendments.

**Consent to Participate:** Informed consent was obtained from all individual participants included in the study.

**Consent to Publish:** All participants signed informed consent regarding publishing their data.

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