



Correlates of Stigma in People with Epilepsy

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Background and Purpose Epilepsy is often associated with substantial stigma. This study evaluated clinical correlates of stigma in a sample of people living with epilepsy (PLWE) considered high risk due to frequent seizures or other negative health events.

Methods Data were derived from an epilepsy self-management clinical trial. Standardized measures assessed socio-demographics, epilepsy stigma, epilepsy severity, self-efficacy, self-management competency, health literacy, depressive symptoms severity, functional status, social support and quality of life.

Results There were 120 individuals, mean age of 41.73 (SD=17.08), 81 men (66.9%), and 79 (65.3%) African-American. Individual factors correlated with worse stigma were indicative of more severe or poorly controlled seizures (frequent seizures, worse seizure severity scores, more antiepileptic drugs), mental health comorbidity (worse depression severity, other comorbidities) and factors related to individual functioning and perceived competency in managing their health (health literacy, health functioning, self-efficacy, quality of life). Multivariable linear regression found that worse quality of life, and having a mental condition were associated with more stigma ($\beta=6.4$ and 6.8 , respectively), while higher self-efficacy, health literacy and social support were associated with less stigma ($\beta=-0.06$, -2.1 , and -0.3 , respectively). These five variables explained 50% of stigma variation.

Conclusions Stigma burden can be substantial among PLWE and may vary depending on contextual factors such as mental health comorbidity. Care approaches that screen for psychiatric comorbidities, address low health literacy, institute promising self-management programs, and employ effective health communication strategies about epilepsy misconceptions, may reduce epilepsy related burden.

Key Words epilepsy, stigma, care approaches.

INTRODUCTION

Epilepsy affects more than 50 million individuals globally and is associated with stigmatizing attitudes and negative stereotypes among the general public. A cross-cultural European study found that more than half of people living with epilepsy (PLWE) reported feeling stigmatized.¹⁻⁴ The Institute of Medicine reported that epilepsy stigma was an important priority, thereby highlighting the negative effects on PLWE.⁵ While medical treatments for epilepsy have advanced, stigma remains an important factor that leads to psychological suffering in PLWE.⁶ A community-based survey revealed that more than half of PLWE experienced fear, depression, or anger as their initial reaction to being diagnosed with epilepsy, and a quarter of them were concerned about social stigma and the fear of the reactions of other people, which often resulted in shame and loneliness.⁷

Many factors contribute to stigma against PLWE. An ethnographic analysis in rural China revealed that the factors contributing to internalized, interpersonal, and institutional stigma include individual differences (i.e., education level and personality), knowledge and beliefs

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about epilepsy, family support, and the monetary costs associated with hiring PLWE.⁸ A cross-sectional study from Ethiopia noted that seizure frequency and duration were correlated with stigma.⁹ Kumar et al.¹⁰ also found that a higher seizure frequency was associated with worse epilepsy-related stigma. Additionally, behaviors that may be viewed as socially unacceptable signs associated with seizures (i.e., incontinence and tongue biting during a seizure) were found to also contribute to perceived stigma.⁹ In a systemic review of correlates of stigma in PLWE in Western countries, Baker et al.² categorized predictors of stigma into a demographic variable (i.e., country of origin), illness-related variables (i.e., type, severity, and frequency of seizures, and epilepsy-related injuries), and psychosocial variables [i.e., poor global quality of life (QOL), low social support, depression, anxiety, and poor access to epilepsy knowledge].

Stigma is correlated with low self-esteem, low self-efficacy, stress, poor social relationships, poor medication adherence, unemployment, and worse access to housing.^{2,11} Comorbid psychiatric illnesses such as depression and anxiety may also contribute to increased stigma against PLWE, and lead to a strategy of retreat and secrecy that has a negative effect on QOL and reinforces the perception of stigmatization.¹² A study performed in the US found that psychiatric comorbidity was one of several conditions commonly found in both male and female PLWE.¹³

Because the impact of stigma on the lives of PLWE is often underestimated by healthcare workers,¹⁴ and epilepsy-related stigma has such far-reaching consequences, identifying factors associated with increased stigma against PLWE at high risk of poor outcomes might help inform care methods for reducing their epilepsy burden. The primary objective of this study was to determine whether demographic and clinical correlates of stigma in a population considered at high risk due to recently experiencing frequent seizures in addition to experiencing other negative health events (NHEs) might differ from those found in previous studies reported in the literature. The second objective was to determine the extent to which these correlates are independently associated with stigma in this population.

METHODS

Data for this analysis were derived from screening and baseline data collected immediately prior to intervention in a randomized controlled trial (RCT),¹⁵ funded by the Centers for Disease Control and Prevention (CDC) testing the effects of “self-management for PLWE and a history of NHEs (SMART) ($n=120$). This intervention was intended to reduce NHEs and improve health outcomes in PLWE who have recently exper-

rienced seizures and epilepsy-related complications. The study design comprised a prospective 6-month comparison of SMART versus a 6-month wait-list control.

The study inclusion criteria included a self-reported diagnosis of epilepsy, age ≥ 18 years, experiencing at least one NHE within the previous 6 months of initial screen, providing written informed consent, and being able to participate in the study procedures. NHEs were defined as seizures, accidental or traumatic injury, self-harm attempts, emergency-room visits, and hospitalizations. Exclusion criteria included immediate risk of self-harm, dementia, pregnancy, or inability to read/understand English. Recruitment was conducted in an urban setting in northeastern Ohio, USA.

The study was approved by the local hospital Institutional Review Board (University Hospitals, Case Medical Center; approval no. #12-14-07). The analysis used baseline data collected prior to study randomization, including sociodemographic information for age, sex, ethnicity, race, marital status, level of education, employment status, and income. The research assistants were staff with a bachelor's degree and extensive experience in working with PLWE who had mental-health comorbidity. All of the assessments were performed by a single rater trained by the study principal investigator (a clinical research neuropsychiatrist) according to pre-established and documented reliability standards. The training process employed video clips or live role-playing by volunteers or actors.

Stigma

We assessed perceived stigma using the Epilepsy Stigma Scale (ESS), which is a previously validated 10-item scale that assesses the degree to which a person believes that epilepsy is perceived as negative and interferes with one's relationships with others. The scale was adapted by DiIorio et al.¹⁶ from the Parent Stigma Scale that had been developed earlier by Austin et al.,¹⁷ and is scored on a 7-point scale from 1 (strongly disagree) to 7 (strongly agree), with a score of 4 corresponding to neither agreeing nor disagreeing, and higher scores indicating a higher degree of perceived stigma. The alpha coefficient for responses to the ESS shows high internal consistency (Cronbach's $\alpha=0.91$).¹⁶

NHEs

We evaluated self-reported NHEs, which were quantified as the numbers of seizures during both the previous 30 days and the previous 6 months. We also assessed the number of hospitalizations (due to any cause), number of self-harm attempts, and number of accidents or traumatic injuries, all within the previous 6 months. The NHEs were all counted independently in this analysis, and the total number of NHEs was derived

by summing the number of NHEs in each category.

Medical history

The study participants reported their duration of epilepsy, seizure type, and number of prescribed antiepileptic drugs (AEDs). Epilepsy severity was assessed using the Liverpool Seizure Severity Scale, which is a 12-item scale assessing patient who have experienced a seizure during the previous 30 days. The scores range from 1 to 40, with lower scores indicating more-severe seizures.¹⁸ The self-reported Charlson comorbidity index¹⁹ was used to capture comorbidity information on respiratory conditions, arthritis or rheumatism, cancer during the previous 3 years, diabetes, digestive problems, heart conditions, HIV or AIDS, kidney problems, liver problems, and stroke. The subjects also reported the following psychological/mental-health comorbidities: anxiety, attention-deficit hyperactivity disorder (ADHD), bipolar disorder, depression, obsessive-compulsive disorder (OCD), panic disorder, posttraumatic stress disorder (PTSD), and schizophrenia. Individual indicator variables were generated for each mental-health comorbidity, while a binary variable was used to report having any mental-health comorbidity.

Self-assessment scores

Epilepsy self-efficacy and self-management

Self-efficacy in PLWE was measured using the Epilepsy Self-Efficacy Scale (ESES). The score on this 33-item scale ranges from 0 to 330, with higher scores indicating better self-efficacy.²⁰ We measured epilepsy self-management using the Epilepsy Self-Management Scale, on which the scores range from 1 to 190, with higher scores indicating better self-management of epilepsy.²¹

Health literacy

Health literacy was assessed using the Rapid Estimate of Adult Literacy in Medicine–revised, which is an eight-item survey of how well patients can read and understand words encountered during physician visits. A smaller number of recognized words indicates a lower health literacy.²²

Depression

The severity of depressive symptoms was assessed using the Patient Health Questionnaire (PHQ-9)²³ and the Montgomery-Asberg Depression Rating Scale (MADRS).²⁴ The PHQ-9 is a widely used and validated self-rated depression scale that incorporates Diagnostic and Statistical Manual criteria. Its nine assessment items pertain to anhedonia, depressed mood, trouble sleeping, feeling tired, change in appetite, guilt, self-blame or worthlessness, trouble concentrating, feeling slowed

down or restless, and thoughts of being better off dead or hurting oneself. Higher PHQ-9 scores indicate more-severe depression. There are five well-documented categories for the total score on the PHQ-9: minimal depression (1–4 points), mild depression (5–9 points), moderate depression (10–14 points), moderately severe depression (15–19 points), and severe depression (20–27 points).

Depression was also assessed using the rater-administered ten-item MADRS. This scale is administered by trained personnel and addresses core mood symptoms such as apparent and reported sadness, inner tension, reduced sleep, reduced appetite, concentration difficulties, lassitude, inability to feel, pessimistic thoughts, and suicidal thoughts. Scores range from 0–60, and like the PHQ-9, higher MADRS scores indicate worse depression severity. While specific cutoff points for categorizing differing degrees of depression severity are not well established for the MADRS, it is possible to define the following four broad groups based on total MADRS scores: absent or minimal symptoms (0–6 points), mild depression (7–19 points), moderate depression (20–34 points), and severe depression (35–60 points). Both the PHQ-9 and the MADRS were applied to the present research participants.

Functional status

Functional status was assessed using the 36-item Short-Form Health Survey,²⁵ which is a multipurpose health assessment that yields two psychometrically based components: physical component summary (PCS) and mental component summary (MCS). Scores range from 0 to 100, with lower scores indicating a worse level of functioning.

QOL and social support

QOL was assessed using the 10-item Quality of Life in Epilepsy (QOLIE-10) scale,²⁶ which is a self-administered questionnaire developed from the original 89-item QOLIE-89. The QOLIE-10 comprises the seven components of seizure worry, overall QOL, emotional well-being, energy/fatigue, cognitive functioning, medication effects, and social functioning. Scores range from 1 to 5, with higher scores indicating worse QOL. Previous studies have shown that the QOLIE-10 has good test-retest reliability and that the results are correctstrongly correlated with those on the 31-item QOLIE-31.²⁷

The Multidimensional Scale of Perceived Social Support (MSPSS) measures social support on a 12-item scale based on an individual's perception of social support provided by family and friends and their satisfaction with that support. The MSPSS score ranges from 1 to 84, with higher scores indicating better perceived social support.²⁸

Statistical analysis

Statistical analysis was performed using STATA (version 13.1, StatCorp, TX, USA). The correlations between sociodemographic characteristics, clinical traits, and self-assessment scores with the ESS were assessed. Pairwise Pearson's (r) or point biserial (r_{pb}) correlations were used to assess the relationships between ESS scores and quantitative and binary variables, respectively.

To explore the correlates of interest independently associated with ESS scores, we conducted a multivariable linear regression with ESS scores as the outcome and variables that were trending in association [$p < 0.15$, except for seizure severity ($n=66$), Model 1] (Table 1). We did not consider the functional-status MCS and PCS variables, since they were moderately to strongly correlated with other more-specific variables of interest [i.e., MCS with QOLIE-10 ($r=-0.76$) and ESES ($r=0.55$), and PCS with QOLIE-10 ($r=-0.34$) and physical comorbidity ($r_{pb}=-0.39$)]. We also included only the binary variable for having a comorbid psychological/mental-health condition in lieu of the individual variables for each mental-health condition in order to minimize the number of variables that were initially tested. A backward stepwise variable selection approach (with a significance threshold of $p > 0.15$ for removal) was employed to determine which of the variables of interest were retained in this exploratory model (Model 1). We subsequently reiteratively included each mental-health condition variable to determine which was underlying the relationship between having a mental-health condition and ESS scores (Model 2). With respect to depression, we subsequently assessed the relationships for depression severity using the PHQ-9 (Model 3) and MADRS (Model 4) with the final variables included in Model 1. Model fit, homoscedasticity, and the variable inflation factor (to assess for multicollinearity amongst predictors) were assessed for each regression model.

RESULTS

Table 1 lists the demographic and clinical correlates of stigma. Stigma, as measured using the ESS, did not differ by RCT assignment (t -test: $p=0.32$). There were 120 individuals in the sample, who were aged 41.73 ± 17.08 years (mean \pm SD) and included 81 males (66.9%). Nine (7.4%) of the participants were Hispanic and 79 (65.3%) were African-American. Most of them were not married ($n=83$, 68.6%), had more than a high-school education ($n=68$, 56.2%), were unemployed ($n=96$, 79.3%), and had a yearly income of less than US\$ 25,000 ($n=105$, 86.6%). The most-common mental-health diagnoses were depression ($n=69$, 57.5%) and anxiety ($n=39$, 32.2%).

Pearson's correlation coefficients (r values) indicated that

stigma in PLWE was positively correlated with the number of NHEs during the previous 6 months ($p=0.027$), seizure severity ($p=0.034$), number of epilepsy medications ($p=0.035$), depression scores ($p < 0.0001$), and health-related QOL ($p < 0.0001$), and negatively correlated with health literacy ($p = 0.0001$), self-efficacy ($p < 0.0001$), social support ($p < 0.0001$), and functional status ($p < 0.0001$ for MCS, $p = 0.0005$ for PCS). The point biserial correlation coefficients (r_{pb} values) indicated that stigma in PLWE was correlated with a comorbid health diagnosis ($p < 0.01$), low income ($p = 0.04$), any mental-health diagnosis ($p < 0.0001$), and specific diagnoses of anxiety ($p = 0.017$), bipolar disorder ($p < 0.0028$), OCD ($p = 0.035$), and PTSD ($p = 0.034$).

The distribution of ESS scores did not violate normality assumptions (skewness = -0.10, kurtosis = 2.1, $p = 0.08$ in a Shapiro-Wilk normality test, and $p = 0.13$ in a Shapiro-Francia normality test). The baseline model to which variable selection was applied included correlates that were marginally associated with ESS scores ($p < 0.15$) (Table 1), and included income, number of epilepsy medications, total number of NHEs during the previous 6 months, any mental-health diagnoses, and self-assessment scores for self-efficacy, self-management, health literacy, social support, and health-related QOL. The following five variables that were independently and significantly ($p < 0.05$) associated with stigma were retained (Model 1) (Table 2): self-efficacy, health literacy, social support, health-related QOL, and having any mental-health diagnosis. Worse QOL (i.e., higher QOLIE-10 scores) and having a mental condition were associated with experiencing significantly more stigma [$\beta = 6.4$ [95% confidence interval (CI) = 3.4 to 9.4, $p = 4 \times 10^{-5}$] and 6.8 (95% CI = 1.8 to 11.7, $p = 0.008$), respectively], while higher self-efficacy, health literacy, and social support were associated with less stigma [$\beta = -0.06$ (95% CI = -0.11 to -0.01, $p = 0.028$), -2.1 (95% CI = -3.1 to -1.0, $p = 2 \times 10^{-4}$), and -0.3 (95% CI = -0.4 to -0.1, $p = 9 \times 10^{-4}$), respectively]. These five variables together explained 50% of the variation in stigma.

An analysis of the individual mental-health diagnoses revealed that only depression was significantly associated ($p < 0.05$) with stigma after adjusting for self-efficacy, health literacy, health-related QOL, and social support (Model 2) (Table 2). ADHD (5.8%), anxiety (32.5%), bipolar disorder (21.7%), OCD (2.5%), panic disorder (11.7%), and schizophrenia (4.2%) were not independently associated with stigma after adjusting for the Model 1 variables ($p > 0.15$, data not shown). PTSD (10.8%) was marginally associated with stigma ($p = 0.15$), and this relationship became weaker ($p = 0.21$) after adjusting for depression (data not shown).

Focusing on depression, we subsequently investigated the relationships of stigma with the scores for the severity of de-

Table 1. Baseline characteristics and clinical correlates of stigma against people living with epilepsy (n=120)

Characteristic	Value	Correlation (r or r _{pb}) ^a
Characteristic		
Age, years (n=119)	41.3±11.8 [19–70]	-0.002 (p=0.98)
Sex		
Male	81 (67.5)	-0.017 (p=0.85)
Female	39 (32.5)	
Race		
African-American	78 (65.0)	0.059 (p=0.54)
White	33 (27.5)	(African-American vs. white)
Not reported	9 (7.5)	
Ethnicity		
Hispanic	9 (7.5)	-0.035 (p=0.70)
Non-Hispanic	110 (90.8)	(Hispanic vs. non-hispanic)
Not reported	1 (0.8)	
Unknown	1 (0.8)	
Marital status		
Married/cohabitating	38 (31.7)	-0.14 (p=0.14)
Not married	82 (68.3)	
Education level (n=119)		
High school or less	52 (43.7)	-0.13 (p=0.14)
More than high school	67 (56.3)	
Employment status		
Employed	24 (20.0)	-0.16 (p=0.09)
Unemployed	96 (80.0)	
Income (n=119)		
<US\$ 25,000	105 (86.6)	-0.19 (p=0.04)
≥US\$ 25,000	15 (12.4)	
Medical history		
Disease duration, years (n=115)	20.6±15.2 [0–62]	0.13 (p=0.18)
Seizure type		
Generalized seizure	85 (70.8)	0.021 (p=0.82)
Other	35 (29.2)	
Number of antiepileptic drugs (n=118)	1.64±0.84 [0 to 4]	0.19 (p=0.035)
Seizure severity (LSSS score) (n=66)	56.9±19.0 [7.5 to 90]	0.26 (p=0.034)
Number of negative health events during the previous 6 months (n=116)	15.1±34.2 [0 to 257]	0.21 (p=0.027)
Seizures during the previous 6 months (n=120)	100 (83.3)	0.07 (p=0.42)
Accidents (n=116)	18 (15.5)	-0.04 (p=0.68)
Emergency-room visit (n=119)	53 (44.5)	-0.01 (p=0.89)
Hospitalization (n=116)	11 (9.5)	0.09 (p=0.32)
Physical comorbidity	78 (65.0)	0.14 (p=0.13)
Any mental-health diagnosis	80 (66.7)	0.38 (p=0.0001)
Attention-deficit/hyperactivity disorder	7 (5.8)	0.021 (p=0.82)
Anxiety	39 (32.5)	0.22 (p=0.017)
Bipolar disorder	26 (21.7)	0.27 (p=0.0028)
Depression	69 (57.5)	0.385 (p=0.0001)
Obsessive-compulsive disorder	3 (2.5)	0.19 (p=0.035)
Panic disorder	14 (11.7)	0.059 (p=0.52)
Post-traumatic stress disorder	13 (10.8)	0.19 (p=0.034)
Schizophrenia	5 (4.2)	0.077 (p=0.41)

Table 1. Baseline characteristics and clinical correlates of stigma against people living with epilepsy ($n=120$) (continued)

	Value	Correlation (r or r_{pb})*
Self-assessment scores		
Epilepsy stigma (ESS score)	40.7±17.2 [10–70]	NA
Epilepsy self-efficacy (ESES score)	248.4±52.7 [93–340]	-0.46 ($p<0.0001$)
Epilepsy self-management (ESMS score)	140.3±17.3 [91–184]	-0.14 ($p=0.13$)
Health literacy (REALM-R score)	6.5±2.1 [0–8]	-0.23 ($p=0.010$)
Social support (MSPSS score)	64.9±16.2 [20–84]	-0.47 ($p<0.0001$)
Health-related QOL (QOLIE-10 score)	3.0±0.9 [1.2–4.8]	0.57 ($p<0.0001$)
Functional status (SF-36 score)		
Mental component (MCS score)	39.7±13.1 [16.4–66.8]	-0.55 ($p<0.0001$)
Physical component (PCS score)	42.1±10.0 [19.8–62.6]	-0.31 ($p=0.0005$)
Depression severity (PHQ-9 score)		
Minimal depression (1–4)	10.7±7.2 [0–27]	
Mild depression (5–9)	28 (23.3)	
Moderate depression (10–14)	30 (25.0)	0.59 ($p<0.0001$)
Moderately severe depression (15–19)	27 (22.5)	
Severe depression (20–27)	18 (15.0)	
Depression severity (MADRS score)	17 (14.2)	
Depression severity (MADRS score)	18.1±11.5 [0–41]	0.59 ($p<0.0001$)

Data are mean±SD, mean±SD [range], or n (%) values.

*Pearson's correlation and p values for quantitative variables (r) or point biserial correlation and p values for binary variables.

ESES: Epilepsy Self-Efficacy Scale, ESMS: Epilepsy Self-Management Scale, ESS: Epilepsy Stigma Scale, LSSS: Liverpool Seizure Severity Scale, MADRS: Montgomery-Asberg Depression Rating Scale, MCS: mental component summary, MSPSS: Multidimensional Scale of Perceived Social Support, PCS: physical component summary, PHQ-9: Patient Health Questionnaire, QOL: quality of life, QOLIE-10: 10-item Quality of Life in Epilepsy, REALM-R: Rapid Estimate of Adult Literacy in Medicine-revised, SF-36: 36-item Short-Form Health Survey.

pressive symptoms (PHQ-9 and MADRS). Due to the very strong correlation between depression severity and QOLIE-10 scores ($r>0.75$), we removed the QOLIE-10 from these models (Models 3 and 4) (Table 2). More-severe depressive symptoms were significantly associated with higher reported levels of stigma ($p<1\times 10^{-5}$).

DISCUSSION

The primary objective of this study was to determine whether demographic and clinical correlates of stigma in a population considered at high risk due to recently experiencing epilepsy-related complications differ from other reports in the literature. Our findings support the previous research and add to the body of literature regarding the correlates of stigma in PLWE. In this sample, individual factors were strongly correlated with worse levels of stigma, and were indicative of more-severe or poorly controlled seizures (more-frequent seizures or worse seizure severity scores), more prescribed AEDs, mental-health comorbidity (worse depression severity), and factors related to an individual's functioning and perceived health self-management competency (health literacy, mental-health functioning, self-efficacy, and QOL). Except for personal income (which was lower in individuals with a higher stigma burden), there were no associations between

stigma and demographic variables.

The correlation between stigma and depression severity in our study population was stronger than in other studies of PLWE,^{29–31} which was perhaps due to the RCT inclusion criteria specifying that the participants had NHEs, including recent seizures. However, population-based studies have found higher lifetime prevalence rates of anxiety, depressive disorders, and suicidal ideation among PLWE.³² We were unable to analyze the association between stigma and self-harm NHEs due to smallness of the sample for these events. However, in the literature it is reported that a high stigma burden and undertreatment of mental illness may explain why suicide is ten times more common among PLWE than in the general population, and accounts for approximately 12% of all deaths among PLWE.¹³

Psychiatric comorbidities in PLWE have a high prevalence globally,^{13,33,34} and so screening for stigma and mental-health disorders in PLWE is an important step in identifying and treating these illnesses. Underscoring the importance of treating mental-health comorbidities in PLWE, Ribot and Kaner³⁵ highlighted the neurobiological aspects of mood disorders that might facilitate the epileptogenic process in animal models, and perhaps explain the increased risk that patients with primary mood disorders have of developing treatment-resistant epilepsy. Given the known consequences of depres-

Table 2. Multivariable linear regression associations with Epilepsy Stigma Scale scores*

Predictor	Model 1	Model 2	Model 3	Model 4
Self-efficacy (ESES score)	-0.058 (-0.109 to -0.006), 0.028	-0.058 (-0.109 to -0.006), 0.027	-0.068 (-0.120 to -0.016), 0.011	-0.058 (-0.110 to -0.006), 0.029
Health literacy (REALM-R)	-2.07 (-3.14 to -1.01), 1.8×10^{-4}	-2.04 (-3.11 to -0.98), 2.2×10^{-4}	-1.86 (-2.97 to -0.75), 0.0012	-2.08 (-3.16 to -1.00), 2.2×10^{-4}
Social support (MSPSS score)	-0.27 (-0.43 to -0.11), 9.0×10^{-4}	-0.28 (-0.43 to -0.12), 6.5×10^{-4}	-0.25 (-0.41 to -0.08), 0.0034	-0.27 (-0.43 to -0.11), 0.0012
Health-related QOL (QOLIE-10 score)	6.40 (3.43 to 9.37), 4.1×10^{-5}	6.27 (3.27 to 9.26), 6.5×10^{-5}		-
Any mental-health diagnosis	6.76 (1.79 to 11.73), 0.0083	-	-	-
Self-reported depression	-	6.54 (1.79 to 11.30), 0.0075	-	-
PHQ-9 depression score	-	-	0.90 (0.52 to 1.27), 6.0×10^{-6}	-
MADRS depression score	-	-	-	0.60 (0.37 to 0.83), 1.0×10^{-6}
Adjusted R^2	0.499	0.499	0.466	0.481

Data are β (95% confidence interval) or p values.

*Each linear regression model included the variables for which associations are reported; for example, all models included the ESES, REALM-R, and MSPSS, while Model 1 also included the QOLIE-10 and having a mental-health diagnosis. The models including 119 people living with epilepsy since one subject did not complete the MSPSS.

ESES: Epilepsy Self-efficacy Scale, MADRS: Montgomery-Asberg Depression Rating Scale, MSPSS: Multidimensional Scale of Perceived Social Support, PHQ-9: Patient Health Questionnaire, QOL: quality of life, QOLIE-10: 10-item Quality of Life in Epilepsy, REALM-R: Rapid Estimate of Adult Literacy in Medicine-revised.

sive symptoms in PLWE, screening for depression using instruments such as PHQ-9 and the Neurological Disorders Depression Inventory for Epilepsy (NIDD-E)³⁶ can help neurologists target and treat depression, and may improve how PLWE perceive their illness and the associated stigma. Our findings also support the notion that PLWE with depression may also experience a significant stigma burden, and so care approaches that address their depression should also include support for coping with the corrosive effects of stigma on health and functioning. This might include referral to advocacy groups such as the Epilepsy Foundation³⁷ and the National Alliance for the Mentally Ill.³⁸

An additional finding related to the clinical environment in our study was the co-occurrence of anxiety and PTSD in depressed PLWE. Self-stigma is prevalent in patients with PTSD and has an effect on common comorbid symptoms, such as depression.³⁹ There is some evidence that PTSD is itself a risk factor for epilepsy.⁴⁰ While our findings need to be interpreted cautiously given the small number of individuals with PTSD ($n=13$) in this sample, it might be beneficial to screen for PTSD in addition to depression given the availability of evidence-based approaches that can help ameliorate PTSD symptoms.⁴¹ Although there are currently no specific screening instruments to identify anxiety in PLWE, Kwon and

Park⁴² suggested using the self-reported seven-item Generalized Anxiety Disorder-7 (GAD-7)⁴³ questionnaire that addresses whether individuals have been bothered by anxiety-related problems during the previous 2 weeks. Because it takes only 3 minutes to complete the GAD-7, this can be done by patients while they are waiting for their clinical appointment in busy epilepsy clinics.

There is far less evidence-based data for treating PTSD in PLWE than for treating other anxiety disorders.⁴⁴ A recent review of evidence-based treatment for anxiety disorders suggested that serotonin-reuptake inhibitors (SSRIs) (particularly sertraline and paroxetine) could be of value for treating PTSD in PLWE.⁴⁵ However, Margolis et al.⁴⁶ found that perceived stigma predicted an anxiety diagnosis independently of self-reported anxiety, seizure worry, and primary seizure type, and suggested that care approaches for PLWE with PTSD need to include helping them to understand and cope with stigma as a factor that may be influencing their behavior and psychological state.

It is important to identify ways to reduce the stigma burden of PLWE. Our regression analysis of Model 1 (Table 2) revealed that while worse QOL and having a mental condition were associated with more stigma, higher self-efficacy, health literacy, and social support were independently asso-

ciated with less stigma. Low health literacy has been linked to a higher frequency of hospitalizations, and is estimated to cost the US economy US\$ 106–238 billion annually.⁴⁷ To address low health literacy in the US, the Institute of Medicine and the US Department of Education have recommended health-related information be written at the reading level of sixth- to eighth-graders.^{48–50} However, Elliott and Shneker⁵¹ found that 85% or more of the content on the epilepsy.com website (a comprehensive and credible resource) was not consistent with that reading level. In order to help reduce the stigma burden of epilepsy, healthcare providers should provide written and web-based educational materials that are highly readable and easily understood for people at all reading levels.⁵² Supporting the potential utility of this resource, a recent study of adolescent PLWE found that easy-to-understand information about their illness was directly associated with higher self-efficacy.⁵²

Additionally, self-management programs that target both epilepsy and mental illness have the potential to provide adaptive methods for managing both illnesses and reduce depressive symptoms. Since 2009, the Managing Epilepsy Well Network of the CDC Prevention Research Centers has focused on addressing mental-health issues in epilepsy with the development and testing of several evidence-based self-management practices.⁵³ A small randomized trial of this type of self-management program called “Targeted Self-Management for Epilepsy and Mental Illness” (TIME) is noteworthy. In addition to general mental health and epilepsy self-management principles, the TIME program addressed facts and myths about mental illness and epilepsy, stigma, and strategies on stigma coping. Findings from this study suggested that self-management reduced depression.⁵⁴

There are challenges to address when attempting to destigmatizing epilepsy. A recent review of studies of epilepsy misconceptions and stigma reduction found that misconceptions reflected socially exclusionary attitudes directed at PLWE, ignorance about treatment, and overgeneralizations that were stigmatizing. Given the paucity of stigma-reduction studies involving PLWE, it has been suggested to use health communication strategies that engage individuals and communities in formats that are easily accessible, such as technology-based approaches.⁵⁵ Such approaches look promising. A recent prospective randomized controlled pilot study of 295 PLWE investigated the effects of 2 brief web-delivered stigma-reduction videos highlighting role competency and social inclusion compared with a control video that only employed knowledge approach. The two videos used young adult actors portraying young adult PLWE in social situations. A web-based survey revealed that, compared with the control video (knowledge alone), the stigma-reduction videos posi-

tively impacted epilepsy attitudes and increased epilepsy knowledge.⁵⁶ Novel communication strategies that address misconceptions and attitudes about epilepsy could be useful for addressing the destigmatization of this disorder.

This study was subject to some limitations, including a single-site setting, cross-sectional design (which made it impossible to assign causality), a relatively small sample, and a control group of PLWE without NHEs. Since all of the measures were obtained simultaneously from subjects, the risk for shared measurement bias in self-reporting was high, and individuals enrolled in a research study performed in the US Midwest might not fully represent the diverse spectrum of PLWE. The self-reporting basis for identifying epilepsy cases in this study is an additional limitation, since we were not able to disentangle possible nonepileptic seizures from epilepsy cases. However, it is important to note that our study is one of the few to focus on PLWE who have had recent health complications, assess for psychiatric comorbidities beyond depression, and include a relatively large proportion of African-American PLWE. All of these aspects increase the generalizability of the present findings to the diverse spectrum of PLWE.

In line with other reports,⁵⁶ the present study found that PLWE can experience a substantial stigma burden, which may vary depending on contextual factors such as mental-health comorbidity. Care approaches that screen for common psychiatric comorbidities, address low health literacy, implement promising self-management programs, and employ effective health communication strategies to engage individuals and communities about public misconceptions about epilepsy may reduce the burden related to epilepsy. Future research needs to include longitudinal studies of stigma against PLWE who have experienced recent seizures or other epilepsy-related complications.

Author Contributions

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Conflicts of Interest

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