

Characterizing Healthcare Utilization and Spending for Epilepsy and Seizures in the U.S., 2016-2022

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Introduction

Epilepsy¹⁻⁴

Chronic neurological **condition**

Characterized by recurrent, unprovoked seizures

~4 million active cases in the U.S.

\$12.5 - \$28 billion annual spending

Non-Epilepsy Seizures (NES)⁵⁻⁷

Provoked, temporary **event**

Physiological or psychological cause

~109 per 100,000 people in U.S.

\$110 - \$920 million annual lifetime cost

- Both conditions also impose significant mental, physical, and societal burdens

Objective: To assess the healthcare utilization and spending patterns to provide insight into the economic burden and healthcare challenges faced by epilepsy and NES patients.

Methods

- Data source – Medical Expenditure Panel Survey
- Baseline characteristic 1:1 matching
- Independent variables:
 - Epilepsy vs. NES diagnosis
 - Socio-demographics
 - Year of observation
- Dependent variables: utilization and expenditure**
 - Use: zero-inflated negative binomial regression
 - Incidence rate ratios – to quantify likelihood of healthcare encounter or use
 - Spending: (1) logistic regression and (2) GLM with Gamma distribution and log-link
 - Cost ratio to assess incremental spending
- Marginal means estimated via recycled predictions to compare burden across:
 - Epilepsy vs. NES
 - Pre-pandemic (2016-2019) vs. COVID-19 pandemic (2020-2022)

Results

- Initial cohort: 381 unweighted (4.5M weighted) U.S. adults with epilepsy and 653 unweighted (6.6M weighted) with NES
- Post-matching: 264 unweighted U.S. adults in each cohort with no statistically significant differences between groups (Table 1)

Table 1. Key Baseline Characteristics (After Matching)

Characteristic	Epilepsy 3,013,342 (264)	NES 2,691,432 (264)
Age Category		
18-24	254,203 (8.4)	238,814 (8.9)
25-44	909,742 (30)	732,519 (27)
45-64	1,214,968 (40)	1,112,679 (41)
65 +	634,428 (21)	607,421 (23)
Census Region		
Northeast	577,959 (19)	536,521 (20)
Midwest	713,441 (24)	613,701 (23)
South	1,093,039 (36)	983,377 (37)
West	628,904 (21)	557,834 (21)
Education Level		
No degree	383,422 (13)	535,020 (20)
High school/GED	1,651,460 (55)	1,441,946 (54)
BS, MS, or Both	677,963 (23)	451,381 (17)
Doctorate degree	8,928 (0.30)	4,368 (0.16)
Other	291,568 (9.7)	258,717 (9.6)
Employment Status		
Unemployed all year	1,759,082 (58)	1,690,939 (63)
Employed all year	1,049,966 (35)	819,871 (31)
Employed part of year	204,294 (6.8)	180,622 (6.7)
Insurance Coverage		
Uninsured	51,362 (1.7)	24,379 (0.91)
Private	1,548,053 (51)	1,518,753 (56)
Public	1,413,927 (47)	1,148,301 (43)

Note: Data are presented as N (%)

Abbreviations: GED = General Educational Development; NES = non-epilepsy seizures

- No significant difference in healthcare utilization (Table 2)
- Significantly lower overall spending in epilepsy compared to NES (\$7,342 less) (Table 2)
 - Significantly higher spending on AEDs in epilepsy group
- Lower likelihood of utilization and reduced spending during COVID-19 in epilepsy group but higher utilization and spending in NES group (Table 3)

Table 2. Incidence and Cost Ratios of Epilepsy to Non-Epilepsy Seizures

Category	IRR (95% CI)	Likelihood	Cost Ratio (95% CI)	Cost Difference
Overall	0.83 (0.63-1.1)	↓17%	0.76 (0.58-0.99)*	↓24%
Inpatient	0.72 (0.49-1.1)	↓28%	0.59 (0.28-1.2)	↓41%
Med Office	0.83 (0.67-1.0)	↓17%	0.82 (0.62-1.1)	↓18%
AED fills	1.22 (1.18-1.27)*	↑22%	1.62 (1.38-1.91)*	↑62%

Table 3. COVID-19 Pandemic Impact on Utilization and Expenditure

Category	Epilepsy		Non-Epilepsy Seizures	
	IRR (95% CI)	Cost Ratio (95% CI)	IRR (95% CI)	Cost Ratio (95% CI)
Overall	0.54 (0.22-1.3)	0.81 (0.34-1.9)	1.8 (0.83-3.7)	1.5 (0.77-3.0)
Inpatient	0.55 (0.21-1.5)	0.21 (0.01-6.7)	1.3 (0.50-3.6)	5.4 (1.1-27)*
Emergency Room	0.30 (0.12-0.71)*	0.22 (0.054-0.91)*	0.66 (0.29-1.5)	0.30 (0.097-0.94)*
Med Office	0.40 (0.18-0.90)*	0.65 (0.25-1.7)	1.0 (0.56-1.8)	1.9 (0.83-4.5)
AED fills	1.2 (1.1-1.3)*	1.0 (0.80-1.3)	0.96 (0.90-1.0)	0.65 (0.38-1.1)

* - statistically significant at 5% level (p < 0.05)

Abbreviations: AED = antiepileptic drug; CI = confidence interval; IRR = incidence rate ratio

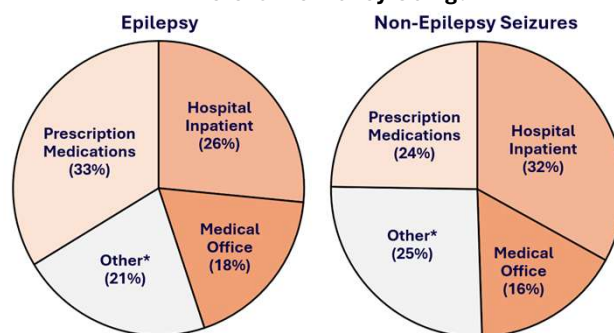
Conclusions

- Despite similar healthcare utilization, NES associated with disproportionately higher financial burden**
- NES-attributable annual spending = \$38.9 billion
- Epilepsy-attributable annual spending = \$21.3 billion
- Future research should investigate the underlying drivers of the elevated costs and create strategies for reducing the overall burden of both conditions
- Strengths:**
 - Nationally representative analysis of healthcare use and costs between epilepsy and NES over time, including COVID-19 pandemic period
- Limitations:**
 - Limited clinical details and cost data with potential bias
 - Exclusions of high-cost populations and over-the-counter and long-term hospitalization expenses

References

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Where is the Money Going?



*other = emergency room + outpatient + home health and other