Quality of Life and Burden of Epilepsy Patients in United States: A Comparative Study of Matched Case-Control Based on Medical Expenditure Panel Survey (MEPS), 2017-2021

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Background and Objective

- Epilepsy is a neurological disorder characterized by recurrent seizures. According to the World Health Organization (WHO), epilepsy is one of the most common neurological disorders globally, affecting approximately 50 million people worldwide.[1] Epilepsy affects approximately 3.4 million people in the United States.[2]
- In addition to physical and psychological burden, epilepsy also has significant healthcare and socioeconomic implications. Healthcare burden associated with epilepsy include expenses related to doctor visits, diagnostic tests (e.g., EEG, MRI), antiepileptic medications, and surgical interventions such as epilepsy surgery or vagus nerve stimulation.[3] As per Begley et al, healthcare costs per person ranged from $10,192 to $47,862 annually.[4]
- The aim of the study was to assess quality of life and healthcare resources utilization (HCRU) among epilepsy patients in the US, compared to matched controls.

Methods

- Medical Expenditure Panel Survey (MEPS) database for the period from 2017 to 2021 was used to assess population-based estimates of quality of life and HCRU burden.
- Epilepsy patients were included if they met the following criteria -
  a) Had a related ICD-10 diagnosis code (G40) and
  b) Were taking >1 epilepsy-related medication and/or had >1 visit to a neurologist.
- Epilepsy patients were matched 1:5 with case controls on age, gender and region with non-epilepsy respondents (those not diagnosed with epilepsy) using Greedy matching algorithm.
- Differences between epilepsy and control cohorts in categorical variables were examined using the Chi-square test, while continuous variables were examined using t-test. A multivariate gamma model with log link function was applied to evaluate healthcare costs. Occurrence/ utilization rate of inpatient and outpatient visits and drug refills were investigated using zero inflated Poisson (ZIP) and Poisson models, respectively, to calculate annual average of health resources.
- All costs have been adjusted to 2021 using the medical component of the US Consumer Price Index.

Results

Selection of analytical cohorts

- A total of 1,12,267 adult respondents were included in MEPS during the study period (2017-2021). Of these, 441 were diagnosed with epilepsy (ICD-10-CM: G40), while 415 additionally had either an epilepsy-related medication and/or neurologist visit within the calendar year (Refer to Figure 1).
- These 415 cases were matched 1:5 with 2,075 non-epilepsy respondents as case controls, based on gender, age, geographic region and survey year. Matching was carried out using the Greedy matching algorithm. (Refer to Table 1)

Figure 1: Inclusion/Exclusion criteria to identify analytical cohorts

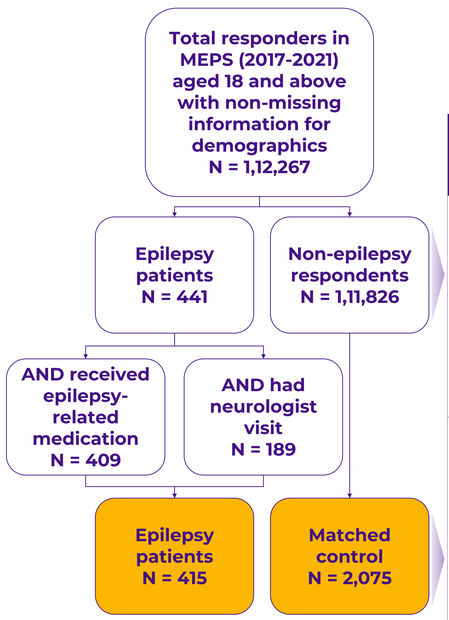


Table 1: Cohort characteristics before and after matching

		Cohort characteristics		
		Epilepsy	Non-epilepsy	P-value
Before Matching	N	415	1,11,826	-
	Age (years)			
	Mean(SD)	45.1 (1.3)	47.9 (0.2)	0.0351
	Gender			
	Male	50.4%	48.4%	0.5799
	Geographic region			
	South	33.1%	38.0%	0.0970
After matching	N	415	2,075	-
	Age (years)			
	Mean(SD)	45.1 (1.3)	45.1 (0.4)	0.9764
	Gender			
	Male	50.4%	52.1%	0.6602
	Geographic region			
	South	33.1%	33.9%	0.3940

Cohort characteristics

The cohorts were well matched on all characteristics that were used in the matching process. Substantial differences showed between the cohorts in terms of various other characteristics, reflecting the role of epilepsy:

- Epilepsy respondents were nearly twice as likely to be on public insurance as the control cohort (43.7% vs. 22.2%; p-value: <0.001).
- Epilepsy respondents had lower education levels compared to controls ((<=12 grade; 53.9% vs 40.6%; p-value: 0.0025).
- 61.9% epilepsy respondents were unemployed at the time of the survey compared to only 32.6% in the control group (p-value: <0.001).
- A higher proportion of epilepsy group belong to the lower income strata (low to poor) compared to the control group (36.9% vs 24.1%, p-value: 0.0011). Also, 1 in 5 persons were unable to pay medical bills in the last 12 months among the epilepsy group compared to 1 in 10 in the control group (p-value: <0.0001). (Refer to Table 2)

Table 2: Baseline demographics and socio-economic characteristics

	Epilepsy patients	Matched controls	P-value
Health insurance coverage indicator			
Public only	43.7%	22.2%	<0.0010
Private only	52.2%	69.6%	
Race			
White	75.9%	76.5%	
Black	13.9%	12.9%	0.0023
Others	2.5%	7.6%	
Multiple races reported	7.7%	3.0%	
Education level completed			
≤Grade 12	53.9%	40.6%	
1–2 years college	20.0%	21.3%	0.0025
3–4 years college	19.5%	25.0%	
5+ years college	5.7%	12.4%	
Employment status			
Unemployed	61.9%	32.6%	<0.0010
Poverty status			
Low to poor income	36.9%	24.1%	
Middle income	28.0%	32.1%	0.0011
High income	35.0%	43.8%	
Problem paying medical bills			
Yes	21.0%	8.7%	<0.0001

Quality of life

- The epilepsy group reported poorer quality of life and health status compared to the control group (34.5% poor/fair vs 13.2%, p-value: <0.0001).
- Psychological health indicators were also worse off among the epilepsy group. 25.9% reported poor to relatively fair mental health compared to 9.1% in control group (p-value: <0.0001); 34% epilepsy responders reported depression (several days or more than half day or nearly every day in last 2 weeks) compared to 16.5% in the control group.
- Notable differences were also seen in social limitations (23.5% epilepsy vs 4.9% control, p-value: <0.0001) and cognitive incapability (35.8% vs 4.6%, p-value: <0.0001). (Refer to Table 3)

Table 3: Quality of life indicators

	Epilepsy patients	Matched controls	P-value
Perceived health status			
Poor/Fair	34.5%	13.2%	<0.0001
Perceived mental health status			
Poor/Fair	25.9%	9.1%	<0.0001
Felt depressed in the last 2 weeks			
Several days to nearly everyday	34.0%	16.5%	<0.0001
Social/recreational limitations			
Yes	23.5%	4.9%	<0.0001
With cognitive limitations			
Yes	35.8%	4.6%	<0.0001

Burden of healthcare cost

- Healthcare cost associated with treatment, such as antiepileptic drugs, hospitalizations, and outpatient visits are 3.5 times greater for the epilepsy group than the controls ($28,240 vs $8,218; p-value: <0.0001). (Refer to Figure 2 and 3)
- The incremental cost of $20,022 incurred by epilepsy respondent was contributed by antiepileptic drugs ($7,509, p-value<0.0001), inpatient/ER ($5,423, p-value<0.0001) and outpatient visits ($7,090, p-value: <0.0001). (Refer to Figure 4)

Figure 2: Distribution of healthcare cost by resources among epilepsy patients

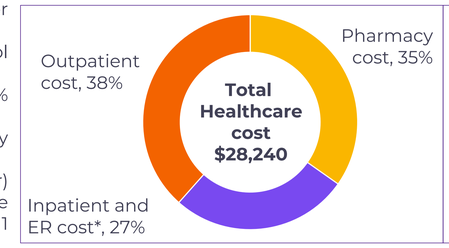
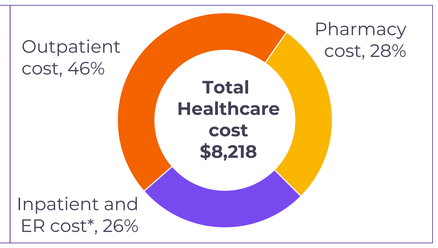
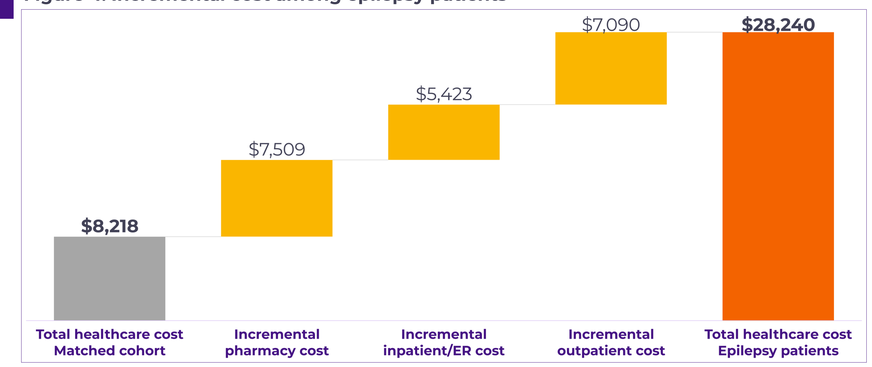


Figure 3: Distribution of healthcare cost by resource type among matched controls



*ER costs accounted for 2% and 4% of total healthcare expenses respectively for patients with epilepsy and matched-control respondents

Figure 4: Incremental cost among epilepsy patients



Health resource utilization

- Epilepsy respondents had a significantly higher number of annual office-based provider visits (8.2 vs 5.3, p-value: <0.0001) and hospitalizations (9.6 vs 6.6, p-value: <0.0001) compared with control respondents.
- Annual medications including fills and refills were about 2.5 times higher in epilepsy patients than the control group 35.9% vs 13.7%, p-value: <0.0001). (Refer to Table 4)

Table 4: Health resource utilization

	Epilepsy patients	Matched controls	P-value
Office-based provider visits			
% patients	85.1%	59.9%	
Mean annual visit	8.2	5.3	<.0001
Outpatient department visits			
% patients	26.2%	13.5%	
Mean annual visit	2.9	2.4	<.0001
Emergency department visits			
% patients	29.1%	14.6%	
Mean annual visit	1.2	1.0	<.0001
Hospitalization			
% patients	16.1%	6.6%	
Mean length of stay (days)	9.6	6.6	<.0001
Medications including fills/refills			
% patients	100%	62.4%	
Mean annual fills/refills	35.9	13.7	<.0001

Conclusion

- This study underscores the significant burden faced by those diagnosed with epilepsy, in terms of all key metrics – educational levels, income/unemployment, mental health, social functioning, cognitive ability, healthcare resource use and costs.

References

1. Epilepsy factsheet: World health organization (WHO)
2. Epilepsy data and statistics: Center for Disease Control and Prevention (CDC)
3. National Institute of Neurological Disorders and Stroke: Epilepsy and Seizures
4. Begley CE et al, Epilepsia. 2015 Sep; 56(9):1376-87

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