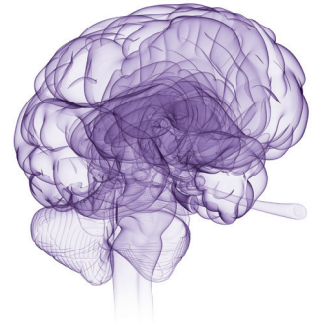


Optimizing Epilepsy Care



90% of the nation's \$3.5 trillion in annual healthcare expenditures are for chronic health conditions, one of which is epilepsy.^{1,2}

  ~\$28 billion in estimated annual US epilepsy-related costs^{3-5*}

Epilepsy is a central nervous system (neurological) disorder in which brain activity becomes abnormal, causing seizures or periods of unusual behavior, sensations, and sometimes loss of awareness. The disease is common, serious, and can go undiagnosed, placing **significant burdens** on patients.^{6,7}


Affects

3.4 million Americans⁴ 

3 million adults | **470,000 children**

- Epilepsy is often misdiagnosed, which can delay proper treatment⁷⁻¹¹
- **1 in 26 people** will develop epilepsy in their lifetime⁸
- Epilepsy-specific costs are **2.2x higher** for uncontrolled epilepsy vs stable epilepsy^{12†‡}

People with epilepsy have 

- Higher prevalence of heart disease, stroke, chronic bronchitis, and mental health disorders^{13,14} 

*Estimate is based on a reported cost of \$26 billion in 2013 converted to 2018 dollar value.^{3,5}

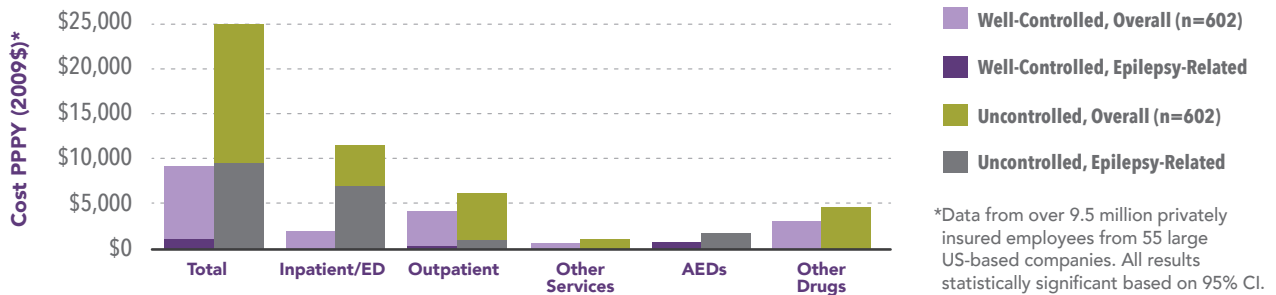
†Retrospective claims study conducted between January 1, 2007, and December 31, 2009, with MarketScan commercial database representing all major regions of the United States.¹²

‡Uncontrolled: Added seizure medication to an existing regimen during year of observation; Stable: No change in seizure medication for at least 1 year.¹²



Higher Healthcare Resource Utilization (HRU) and Costs With Uncontrolled Epilepsy

Annual Overall and Epilepsy-Related HRU Costs by Spend Channel¹⁵



5X higher
rate of ED visits and
inpatient stays^{15†}

7X longer
hospital stays¹⁵

>\$7K
epilepsy-related
HRU costs (PPPY)^{15†}

In the medicaid population with uncontrolled epilepsy, there was a 6x higher rate of ED visits and inpatient stays, 7x longer hospital stays, and >\$5K epilepsy-related HRU costs (PPPY) (n=3,454).^{15†}

These claims were based on data collected in the Medicaid databases from FL, IA, KS, MO, and NJ (~1997 to ~2009). Please see back cover for additional study information.



Hospital encounters are major contributors to the cost of epilepsy¹⁶

Nearly
1.4 million
hospital stays
linked to diagnosis of seizures¹⁶



~\$1.8
billion
in hospital costs¹⁶

~65%
of ED visits
result in hospitalization¹⁶

The estimates shown here are based on data from the HCUP 2005 Nationwide Inpatient Sample. Historical data were drawn from the 1993–2005 NIS.

[†]Adjusted for baseline measures.

[†]Includes cerebral palsy and many other disorders at birth.

AED=antiepileptic drug; CI=confidence interval; ED=emergency department; EMS=emergency medical services; HRU=healthcare resource utilization; IP=inpatient; PPPY=per person per year.

Well-controlled: No change in AED therapy and epilepsy-related IP stays/ED visits.¹⁵

Several Conditions Are Causally Related to Developing Epilepsy⁸

Neurodegenerative disease

10% of new-onset epilepsy in patients ≥ 65 years of age is caused by Alzheimer's disease and other neurodegenerative conditions^{17,18}

Head trauma

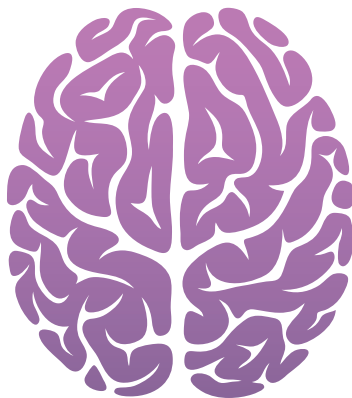
Incidence of developing epilepsy due to head trauma ranges widely—from 2% to over 50%—depending on injury severity²²

Congenital disorders[†]

20% of children < 15 years of age have a congenital cause of epilepsy²³

Stroke

~1 in 10 people who suffer from a stroke develop epilepsy^{17,19,20}



Brain infections

~7% of patients who experience a brain infection will go on to develop epilepsy²⁴

Genetic disorders

> 20 different epilepsy syndromes have been mapped to specific genes²¹

Brain tumors

20% to 45% of patients with brain tumors will experience seizures²⁵



UCB is working to create better solutions for people living with epilepsy

UCB is committed to better serving patients by identifying potential partnerships* based on shared goals



From: Higher HRU and Costs With Uncontrolled Epilepsy

Study Design: Retrospective, longitudinal, matched-cohort analysis.

Study Sample: US adults ≥18 years of age; 110,312 Medicaid population (matched cohorts, n=3,454); 36,529 employer population (matched cohorts, n=602).

Limitations: Work-loss estimates based on subset of commercial claims, potential selection bias per group assignment, excluded less severe seizures, adjusted to 2009\$.

References: 1. Buttorff C, Ruder T, Bauman M. *Multiple Chronic Conditions in the United States*. https://www.rand.org/content/dam/rand/pubs/tools/TL200/TL221/RAND_TL221.pdf. Santa Monica, CA: Rand Corp.; 2017. 2. Center for Medicare & Medicaid Services. National health expenditure data for 2017—Highlights. <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/Downloads/highlights.pdf>. Accessed April 16, 2019. 3. Begley CE, Durgin TL. The direct cost of epilepsy in the United States: a systematic review of estimates. *Epilepsia*. 2015;56(9):1376-1387. 4. Zack MM, Kobau R. National and state estimates of the numbers of adults and children with active epilepsy—United States, 2015. *Morb Mortal Wkly Rep*. 2017;66(31):821-825. 5. Official Data Foundation. Inflation calculator. <https://www.officialdata.org>. Accessed April 23, 2019. 6. Mayo Clinic. Epilepsy. <https://www.mayoclinic.org/diseases-conditions/epilepsy/symptoms-causes/syc-20350093>. Accessed April 19, 2019. 7. Marasco RA, Ramsay RE. Defining and Diagnosing Epilepsy in the elderly. *Consult Pharm*. 2009;24(suppl A):5-9. 8. Institute of Medicine. 2012. Epilepsy across the spectrum: Promoting health and understanding. Washington, DC: The National Academies Press. 9. Marasco RA, Ramsay RE. Managing Epilepsy: Issues in the elderly. *Consult Pharm*. 2009;24 (suppl A):17-22. 10. Ghosh S, Jehi LE. New-onset epilepsy in the elderly: challenges for the internist. *Cleve Clin J Med*. 2014;81(8):490-498. 11. Sutton KA. New-onset seizures in the elderly patient. *J Am Acad Physician Assistants*. 2007;20(2):37-42. 12. Cramer JA, Wang ZJ, Chang E, et al. Healthcare utilization and costs in adults with stable and uncontrolled epilepsy. *Epilepsy Behav*. 2014;31:356-362. 13. Centers for Disease Control and Prevention. Comorbidity in adults with epilepsy—United States, 2010. *Morb Mortal Wkly Rpt*. 2013;62(43):849-853. 14. Seidenberg M, Pulsipher DT, Hermann B. Association of epilepsy and comorbid conditions. *Future Neurol*. 2009;4(5):663-668. 15. Manjunath R, Paradis PE, Parisé H, et al. Burden of uncontrolled epilepsy in patients requiring an emergency room visit or hospitalization. *Neurology*. 2012;79(18):1908-16. 16. Holmquist L, Russo CA, Elixhauser A. Hospitalizations for epilepsy and convulsions. Healthcare Cost and Utilization Project (HCUP) Statistical Briefs. <https://www.ncbi.nlm.nih.gov/books/NBK56315>. Accessed May 8, 2019. 17. Hauser WA, Annegers JF, Kurtland LT. Incidence of epilepsy and unprovoked seizures in Rochester, Minnesota: 1935-1984. *Epilepsia*. 1993;34(3):453-468. 18. Pandis D, Scarmeas N. Seizures in Alzheimer disease: clinical and epidemiological data. *Epilepsy Curr*. 2012;12(5):184-187. 19. Zou S, Wu X, Zhu B, Yu J, Yang B, Shi J. The pooled incidence of post-stroke seizure in 102 008 patients. *Top Stroke Rehabil*. 2015;22(6):460-467. 20. Diehl B, Wandschneider B, Leff A, et al. https://www.aesnet.org/meetings_events/annual_meeting_abstracts/view/192190. Accessed April 24, 2019. 21. Epilepsy Foundation. Genetic testing. <http://www.epilepsy.com/learn/diagnosis/genetic-testing>. Accessed April 19, 2019. 22. Ding K, Gupta PK, Diaz-Arrastia R. Epilepsy after traumatic brain injury. *Translational Research in Traumatic Brain Injury*. Boca Raton, FL: CRC Press/Taylor and Francis Group; 2016:299-314. 23. Hauser WA. Seizure disorders: the changes with age. *Epilepsia*. 1992;33(suppl 4):S6-S14. 24. Annegers JF, Hauser WA, Beghi E, Nicolosi A, Kurtland LT. The risk of unprovoked seizures after encephalitis and meningitis. *Neurology*. 1988;38(9):1407-1410. 25. Maschio M. Brain tumor-related epilepsy. *Curr Neuropharmacol*. 2012;10(2):124-133.

*UCB uses the terms 'partnerships' and 'partnering' broadly to describe how it collaboratively engages with external stakeholders to create value for patients living with severe diseases. UCB's use of these terms is in no way intended to suggest the existence of a legal partnership with any third party entity.

