RESEARCH AMERICA
DISCOVERY. INNOVATION. HEALTH.

LASKER FOUNDATION

If you think research is expensive, try disease.

INVESTMENT IN RESEARCH SAVES LIVES AND MONEY

Epilepsy

Epilepsy is a chronic neurological disorder in which clusters of nerve cells in the brain signal abnormally and cause seizures.[1] There are many causes of epilepsy; therefore, diagnosis varies and can depend on medical history, blood tests, brain imaging tests, and electrical activity monitors such as electroencephalogram (EEG).[1] Generally, a diagnosis requires that an individual experiences or has the propensity to experience more than one seizure.[1] The effects of a seizure can be focal—meaning localized to a single region of the brain — or generalized, with electrical activity affecting the whole brain.[2] To determine which type of seizure a patient has experienced, care providers observe symptoms and use the diagnostic tools outlined above to identify the origin.[2] Epilepsies originate from many causes, so predicting and preventing seizures are very difficult and highlight the necessity for research to further understand this disease.[2]

TODAY

Among neurological disorders, epilepsies rank the **highest** in disability adjusted life years (DALYs) in both men and women, which accounts for the number of years lost due to ill-health.[3]

Epilepsies affect around **65 million** people worldwide, making them one of the most prevalent neurological disorders.[4]

In the U.S., **3.4 million** people had active epilepsy, including **470,000** children aged **0-17**.[5]

COST

$647.37 Billion:

The global estimate for lost economic welfare due to epilepsies in 2016 alone.[6]

Annual health care costs for a person with epilepsy in the U.S. ranged from **$10,192 to $47,862** in 2013.[7]

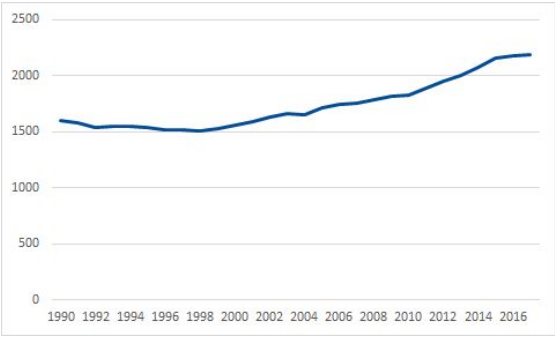
Research Delivers Solutions

There are many causes for epilepsies, including immune system issues, tumors, metabolism, and genetic mutations.[8] Identifying mutations in people with epilepsy can guide research for biomarkers; hundreds of affected genes have been reported.[9] A gene called *SCN,* which makes proteins that help cells convey messages, has mutations linked to multiple types of epilepsies and intellectual disabilities.[9] New DNA sequencing techniques have sped research progress about these mutations. One *SCN* gene, called *SCN1A*, has been linked to the development of generalized epilepsy with seizures, as well as to Dravet Syndrome.[10] However, some mutations in another *SCN* gene, *SCN2A*, do not lead to seizures, showing that mutations may have many different impacts.[11]

Other biomarkers are used to examine electrical activity to identify epilepsies. Since the timing of a seizure is difficult to predict, researchers have focused on electrical activity *between* seizures.[12] High frequency oscillations (HFOs), or fast spikes in brain activity, have been identified using EEG recording.[12] HFOs can be used to determine where a seizure may originate next.

Other research examines microRNAs (miRNAs) in epilepsy. MiRNAs are molecules that regulate the function of proteins.[13] In epilepsy, sometimes miRNAs are abundant, and sometimes they are scarce, like with one called miR-15r-5p.[13] This particular miRNA helps proteins clear cell waste. When impaired, the cell gets confused and increases activity that may lead to a seizure.[13] Biomarkers such as these are helpful to learn the full picture of this disease and to cure it.

Incidence of Epilepsy-Related Deaths in the U.S. [19]



Heightened reporting accuracy is now shedding light on the previously unknown toll of Sudden Unexpected Deaths in Epilepsy (SUDEP).[20] A total of 1 in 1000 adults living with epilepsy today will succumb to SUDEP, highlighting the burden that patients face on a day to day basis. [20]

Epilepsy

Then. Now. Imagine.

THEN
Until the 18th century, patients with epilepsy were thought to be capable of infecting people with their "evil" breath.[14]

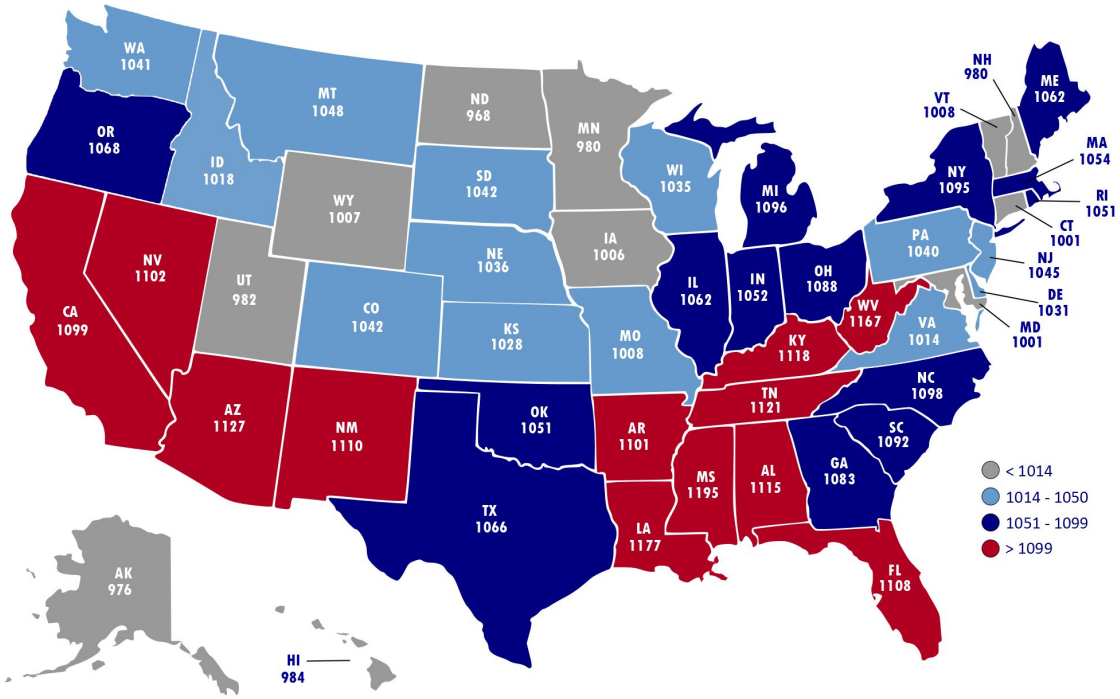
NOW
Modern DNA sequencing techniques deliver new information on genetic mutations, fueling guidance for targeted therapy development.[15]

IMAGINE
Being able to effectively identify specific forms of epilepsy and treat them before they become debilitating.

Effect of Socioeconomic Status

The incidence of reported epilepsy is higher in low and middle income areas (6.68 per 1,000) compared to high income areas (5.49 per 1,000).[16] In the U.S., people on Medicaid are more likely to have epilepsy.[17] When reporting biases such as cultural stigmatization are accounted for, the WHO estimates that those in low or middle income countries make up 80% of people living with epilepsy.[18]

Prevalence of Active Epilepsy Per 100,000 People in the U.S.[21]



1. "The Epilepsies and Seizures: Hope Through Research." NIH. 2019
2. "Epilepsy Overview . . ." American Academy of Neurology. 2019
3. "Addressing the Burden of Epilepsy . . .." Pharmacological Research. 2016
4. "What is Epilepsy?" CURE. 2018
5. "Prevalence and incidence of epilepsy." Neurology. 2017
6. "Global macroeconomic burden . . ." European Journal of Neurology. 2019
7. "National and State Estimates . . ." CDC. 2015
8. "What is Epilepsy?" CURE. 2018
9. "Epilepsy Associated Genes." Seizure. 2017
10. "A Novel SCN1A Mutation Associated with Generalized Epilepsy . . ."AJHG. 2001
11. "Further corroboration of distinct functional . . ." Molecular Medicine. 2019
12. "Electrophysiological Biomarkers of Epilepsy." NIH. 2014
13. "Potential Role of miRNAs as Theranostic Biomarkers of Epilepsy." Molecular Therapy Nucleic Acids. 2018
14. "The History and Stigma of Epilepsy." Epilepsia. 2003
15. "Epilepsy Associated Genes." Seizure. 2017
16. "New Tools for Epilepsy Therapy." Frontiers in Cellular Neuroscience. 2018
17. "National and State Estimates . . ." CDC. 2015
18. "Fact Sheet on Epilepsy."WHO. 2015
19. "GBD Data Visualizations".IHME. 2018
20. "Lets Talk SUDEP." NIH. 2019
21. "National and State Estimates . . ." Morbidity and Mortality Weekly Report. 2017

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