Supplement

Supplementary Tables

Subgraph name	Enrichment score
Adenosine signaling subgraph	0.75
GABA subgraph	0.72
Glutamatergic subgraph	0.48
Neurotransmitter release subgraph	0.46
Serotonergic subgraph	0.33
Notch signaling subgraph	0.20
Mossy Fiber Subgraph	0.14
Brain_derived neurotrophic factor signaling subgraph	0.08
Hormone signaling subgraph	0.05
Long term synaptic potentiation	0.03
Calcium dependent subgraph	0.02
Protein kinase signaling subgraph	0.01

Table S1. Mechanism enrichment scores obtained by querying NeuroMMSig with the targets of carbamazepine in the context of epilepsy. Only subgraphs with an enrichment score in the top 10th percentile (above 0.696) were selected for further analysis.

Search engine	Query	Articles retrieved
SCAIView	([MeSH Disease:"Alzheimer Disease"]) AND [NDD:"GABAergic"]	232
SCAIView	([MeSH Disease:"Epilepsy"]) AND [NDD:"GABAergic"]	2043
PubMed	(GABA receptor) AND Alzheimer	266
PubMed	(GABA receptor) AND Epilepsy	3902

Table S2: A comparison of GABA receptor literature in epilepsy and Alzheimer's disease literature. SCAIView and PubMed were used to query the occurrence of GABA-related publications in the contexts of AD and epilepsy. The results show a much larger representation in epilepsy literature than in AD literature.

Supplementary Figures

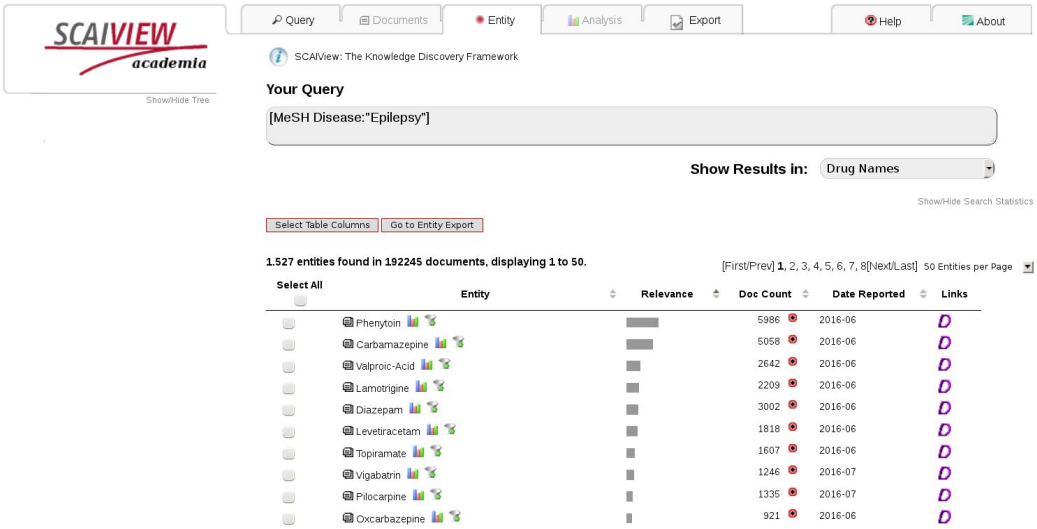

Figure S1: The most frequently mentioned drugs in epilepsy literature.

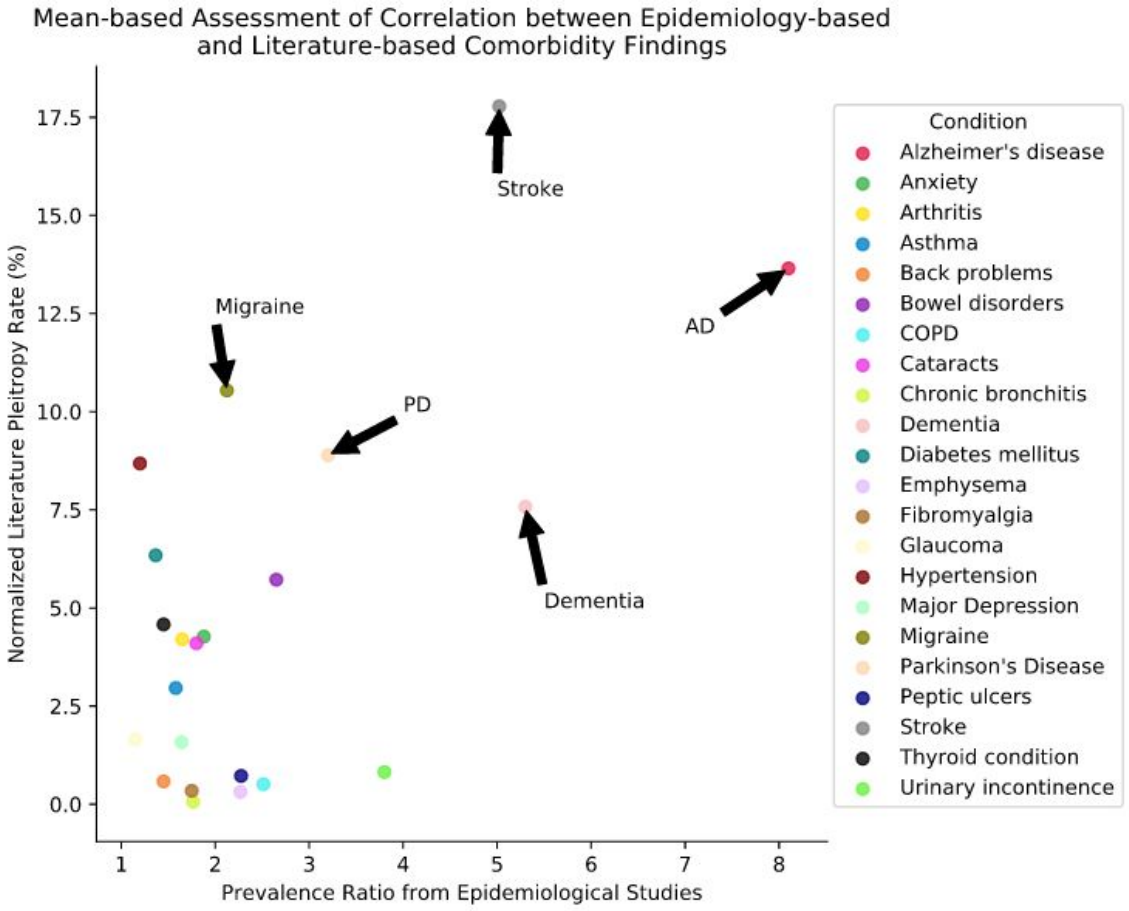

Figure S2: **The epidemiological comorbidity incidences from Keezer *et al.* compared with literature-based gene overlaps**. Their lack of correlation suggests that literature-based gene overlap is neither a good proxy for genetic pleiotropy nor comorbidity incidence. Several other statistical methods suggest the same conclusions and can be found in the Jupyter Notebook at https://github.com/cthoyt/EpiCom/blob/master/Epidemiology%20versus%20Literature-Based%20Comorbidity.ipynb.

Supplementary Text

Text S1: Genes used to query NeuroMMSig and their enriched subgraphs

The gene set composed of the targets of carbamazepine consists of SCN1A, GABRA1, GABRA2, GABRA3, GABRA4, GABRA5, GABRA6, GABRB1, GABRB2, GABRB3, GABRG1, GABRG2, GABRG3, GABRD, GABRE, GABRP, GABRQ, ADORA1, and ADORA3.

Text S2: List of articles (PubMed IDs) from which evidences to create Figure 2 were taken

Epilepsy pathophysiology (black edges): 3280560, 16895979, 17054941, 18093662, 20831750, 22379998, 23535492, and 2553432.

Alzheimer's disease pathophysiology (red edges): 14585504, 19909279, 21969301, and 24919190.

Text S3: Manual Crafting of the Mechanistic Subgraphs

A detailed description of the mapping procedure between relationships and epilepsy related mechanisms can be found in the introduction page of NeuroMMSig.

Text S4: Epilepsy Knowledge Assembly

The Epilepsy Knowledge Assembly can be accessed under the following URL:
https://www.scai.fraunhofer.de/content/dam/scai/de/downloads/bioinformatik/epilepsy.bel