### **Executive Summary**

This report presents a comprehensive analysis of funding trends and network collaborations in Dravet Syndrome and pediatric epilepsy research, conducted to provide actionable insights to our sponsor, Grik Therapeutics. By leveraging historical funding data, network analysis, and predictive modeling, this study aims to inform and enhance strategic funding initiatives and research prioritization efforts. The main findings are summarized as follows:

#### **Introduction**

Dravet Syndrome is a rare, catastrophic form of epilepsy that begins in the first year of life, leading to severe cognitive and developmental delays. Pediatric epilepsy encompasses a range of seizure disorders in children, causing significant neurological and cognitive impairments. Research in these areas is crucial for improving patient outcomes and reducing the burden on families and healthcare systems. This study utilizes data from NIH RePORTER, ClinicalTrials.gov, and additional financial datasets to analyze funding trends and network collaborations in epilepsy research.

#### **Methodology**

The methodology includes data cleaning, exploratory analysis, network analysis, and predictive modeling, all conducted using Python. Data cleaning involved correcting data types and filtering out irrelevant entries. Exploratory analysis generated visualizations to understand funding trends and distributions. Network analysis identified key researchers and their collaborations. Predictive modeling using Random Forest and XGBoost algorithms forecasted project costs, with XGBoost showing superior performance.

#### **Results**

1. **Exploratory Analysis**:
   * **Total NIH Funding for Epilepsy Research by Fiscal Year**: This analysis revealed an overall upward trend in funding, indicating increasing support for epilepsy research. The forecast for 2024 provides a data-driven estimate for future funding.
   * **Top 10 NIH Funding Sources for Dravet Syndrome Research by Administering IC**: NINDS emerged as the largest funder, highlighting the importance of targeting grant proposals to this institute.
   * **Total NIH Funding for Dravet Syndrome Research by State**: The geographic distribution of funding shows that states like California, Michigan, and Massachusetts receive the most funding, indicating strong research activity in these regions.
   * **Funding Distribution by Type of Activity**: R01 grants received the largest share of funding, suggesting a preference for individual research projects.
2. **Network Analysis**:
   * **Top 10 PIs by Total Funding and Project Count**: This table identified the most funded and active researchers, providing insights into successful research areas and potential collaboration opportunities.
   * **Network Graph of PIs and Collaborations**: This visualization showed the structure of the research network, identifying key collaboration hubs and clusters.
3. **Predictive Modeling**:
   * **Performance of Models**: XGBoost outperformed Random Forest with an R^2 score of 0.9034, indicating a very strong fit. The feature importance plot highlighted key factors influencing NIH funding allocations, such as specific funding mechanisms and organizational types.

#### **Conclusion**

The analysis reveals a growing trend in NIH funding for epilepsy research, with NINDS as the largest funder and R01 grants as the most funded activity type. The findings align with existing literature and emphasize the importance of targeting key institutes and aligning proposals with NIH’s funding priorities. Recommendations for Grik Therapeutics include focusing on key funding sources, emphasizing R01 grant proposals, exploring strategic partnerships, and leveraging predictive insights to enhance funding strategies.

#### **Dashboard**

The live interactive dashboard, accessible at [NIH Funding Analysis Dashboard](https://live-epilepsy-funding-research-dashboard.onrender.com/), serves as a comprehensive tool for visualizing and analyzing NIH funding trends and network collaborations. It includes two main tabs: Exploratory Analysis and Network Analysis, each providing unique insights into the funding landscape.