

# **SPATIOTEMPORAL EPIDEMIOLOGY AND ANALYSIS OF MENTAL HEALTH CONDITIONS IN THAILAND**

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# INTRODUCTION



\* GBD Results [Internet]. Institute for Health Metrics and Evaluation. [cited 2022 Jul 21]. Available from: <https://vizhub.healthdata.org/gbd-results/>

\*\* จำนวนผู้ป่วยในจิตเวชเฉลี่ยต่อวัน หน่วยงานในสังกัดกรมสุขภาพจิต ปีงบประมาณ 2556 -2564 [Internet]. Department of Mental Health, Ministry of Public Health. [cited 2022 Jul 21]. Available from: <https://dmh.go.th/report/ipatientavg/>

# INTRODUCTION



IN 2019,  
**970 M**  
PEOPLE WORLDWIDE  
SUFFERED FROM A  
MENTAL CONDITION\*



IN THAILAND 2013–2021,  
**OVER  
1 MILLION**  
PEOPLE PER YEAR  
HAS A MENTAL CONDITION  
AND ACCESS TO THERAPY\*\*

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# INTRODUCTION



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IN THAILAND 2013–2021,  
**OVER  
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AND ACCESS TO THERAPY\*\*



FOR SPATIOTEMPORAL STUDIES  
ON MENTAL DISORDERS,  
**THERE WERE  
NO SPATIOTEMPORAL  
ASSOCIATION STUDIES**  
BETWEEN THE DISORDERS.  
**IN MENTAL HEALTH IN  
THAILAND BEFORE.**

\* GBD Results [Internet]. Institute for Health Metrics and Evaluation. [cited 2022 Jul 21]. Available from: <https://vizhub.healthdata.org/gbd-results/>

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# INTRODUCTION

This study aims to...



## GOVERNMENT POLICIES

May advocate government policies that allocate resources to those regions where people seek mental health services.



## REALIZE THE IMPORTANCE

Help Thai people realize the importance of mental disorders.



## OVERVIEW OF MENTAL HEALTH

See an overview of mental health in Thailand.

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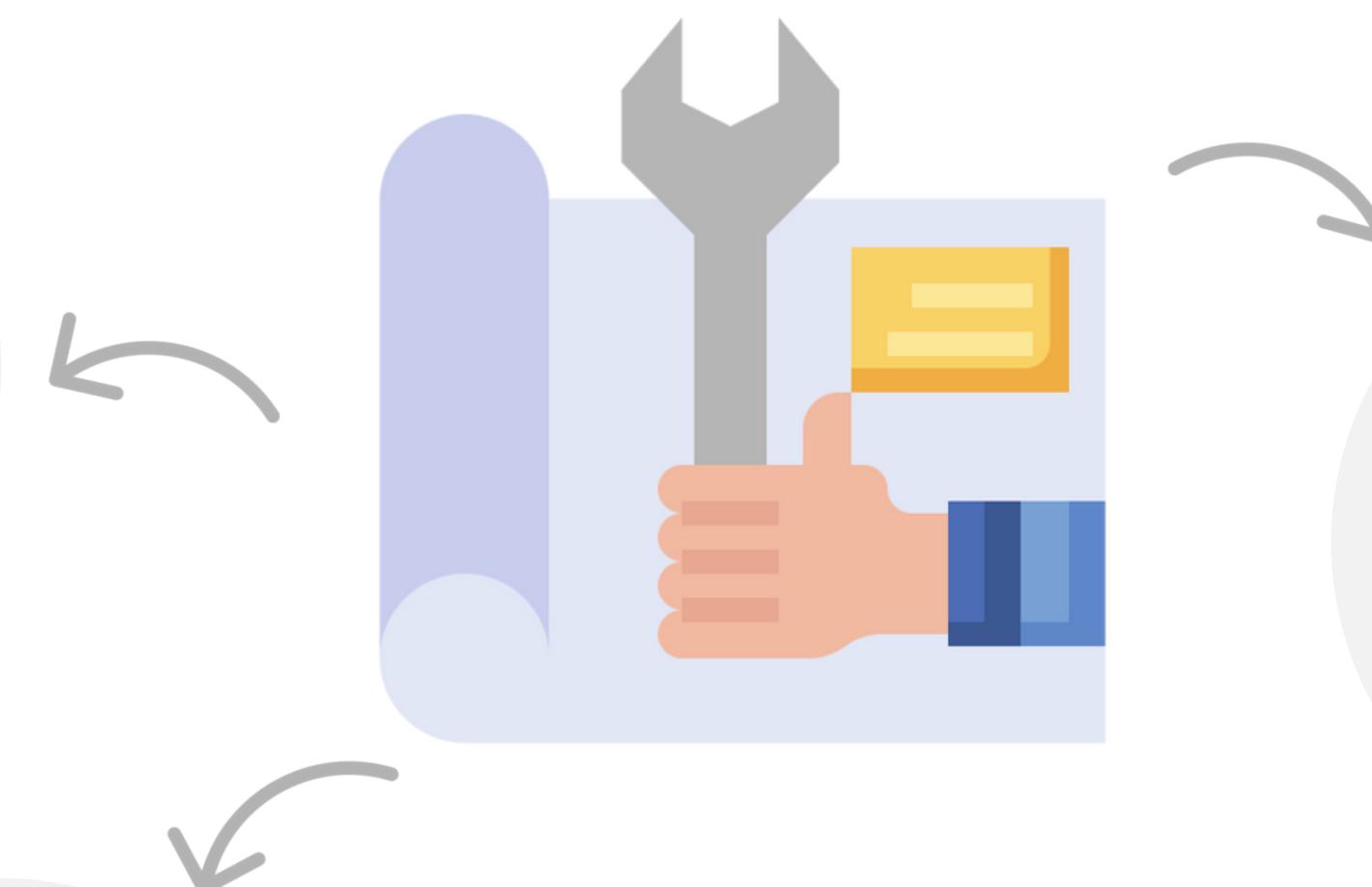
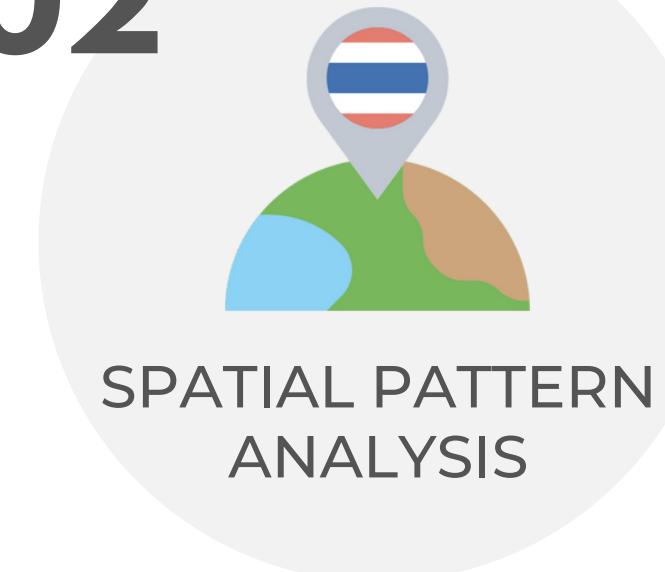


# MATERIALS AND METHODS

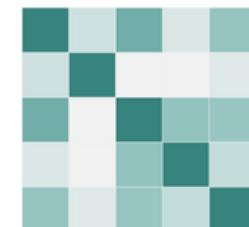
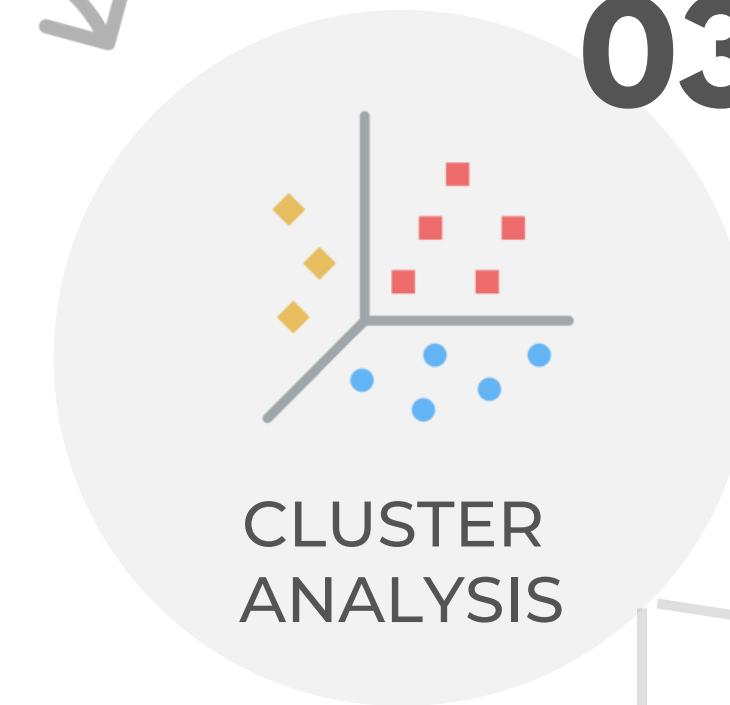
01



02



03



Correlation Matrix



Unsupervised  
Machine learning

# 02.1 DATA SOURCE



**REPORTED MENTAL  
HEALTH SERVICE CASES**  
collected from the health data center  
(HDC), Department of Mental Health,  
Ministry of Public Health (MOPH)



**THAILAND'S MID-YEAR  
POPULATION STATISTICS**  
collected from official statistics  
registration systems



**THE GEOGRAPHIC COORDINATES  
AND PROVINCIAL BOUNDARY DATA**  
obtained from the GEO package file in the  
Global Administrative Region Database  
(GADM)

## 02.2 SPATIAL PATTERN ANALYSIS



### 1.) GLOBAL SPATIAL DETECTION (GLOBAL MORAN'S I)

Determine whether the spatial correlation is positive or negative. It is shown as a clustered, fragmented, or random pattern\*

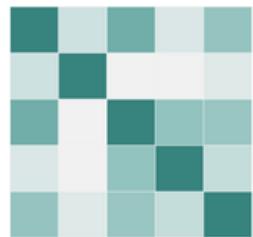
### 2.) LOCAL SPATIAL DETECTION (LOCAL MORAN'S I)

Used to evaluate the autocorrelation within local neighborhoods at the local level\*\*

\*\*Measures of Spatial Autocorrelation <http://dx.doi.org/10.1201/9781351189910-4>

\*\* Mathur M. Spatial autocorrelation analysis in plant population: An overview. Journal of Applied and Natural Science. 2015;7:501-13.

## 02.3.1 CLUSTER ANALYSIS: CORRELATION MATRIX



### THE SPEARMAN'S CORRELATION COEFFICIENT

Nonparametric measure of a non-linear and monotonic relationship  
between two ranked variables\*

\* J, Ashok Kumar, et al. "Aspect-Based Opinion Ranking Framework for Product Reviews Using a Spearman's Rank Correlation Coefficient Method." Information Sciences, vol. 460-461, 2018, pp. 23–41, <https://doi.org/10.1016/j.ins.2018.05.003>.

## 02.3.2 CLUSTER ANALYSIS

### UNSUPERVISED MACHINE LEARNING

#### 1.) K-PROTOTYPE CLUSTERING

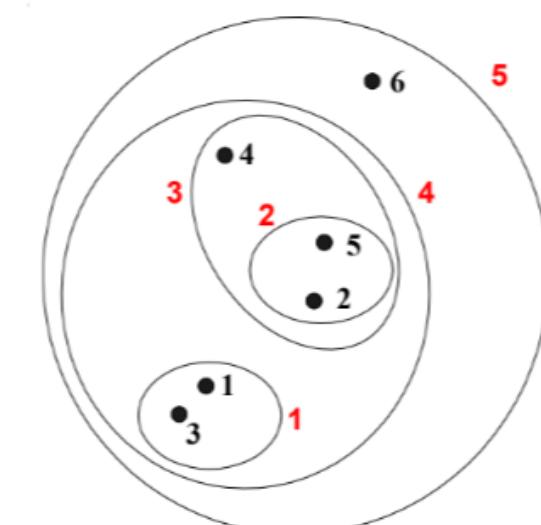
K-MEANS   
**K-PROTOTYPE**

a cluster analysis method derived from the k-means and k-modes algorithms\*

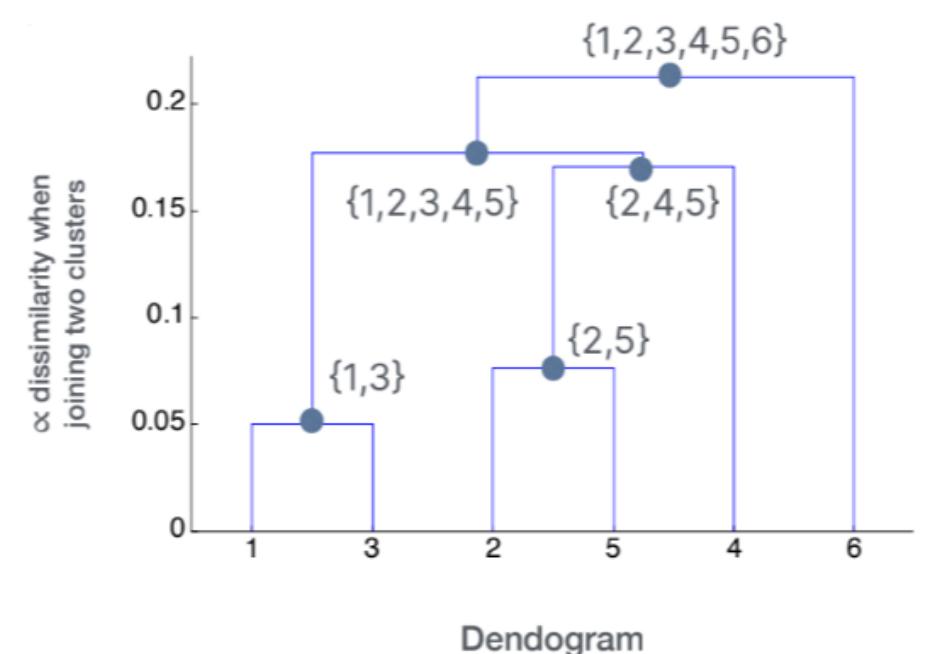


the k-prototypes algorithm can cluster with mixed numerical and categorical values\*\*

#### 2.) <sup>(AGGLOMERATIVE)</sup> HIERARCHICAL CLUSTERING



\*Red numbers mean the number of times merge.



\*<https://bigdata.go.th/big-data-101/k-means-algorithm-for-clustering-large-data-sets-with-categorical-values/>

\*\*<https://kamkanyawee.medium.com/%E0%B8%81%E0%B8%B2%E0%B8%A3%E0%B8%97%E0%B8%B3-clustering-%E0%B8%94%E0%B9%89%E0%B8%A7%E0%B8%A2-k-prototypes-7d8857c62b51>

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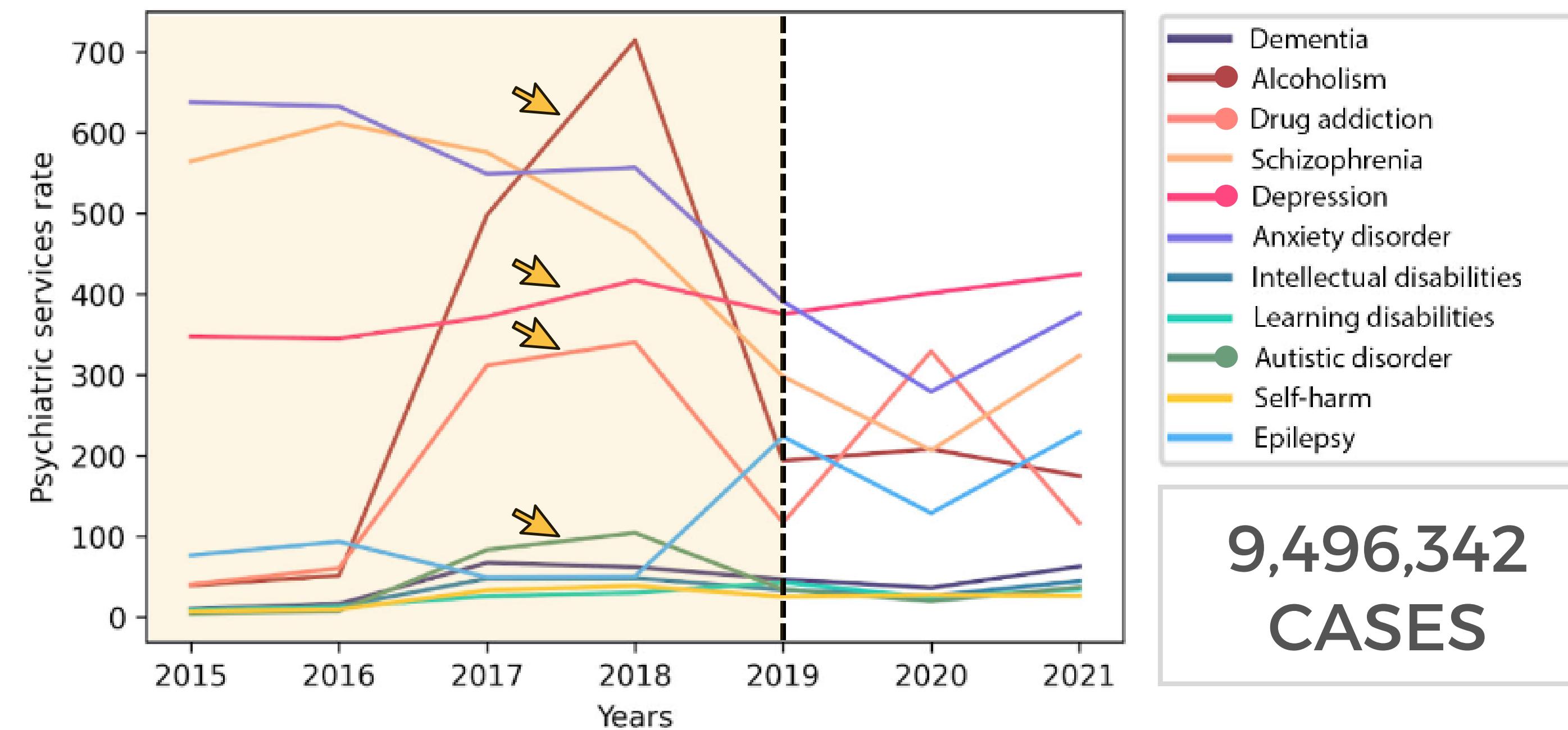
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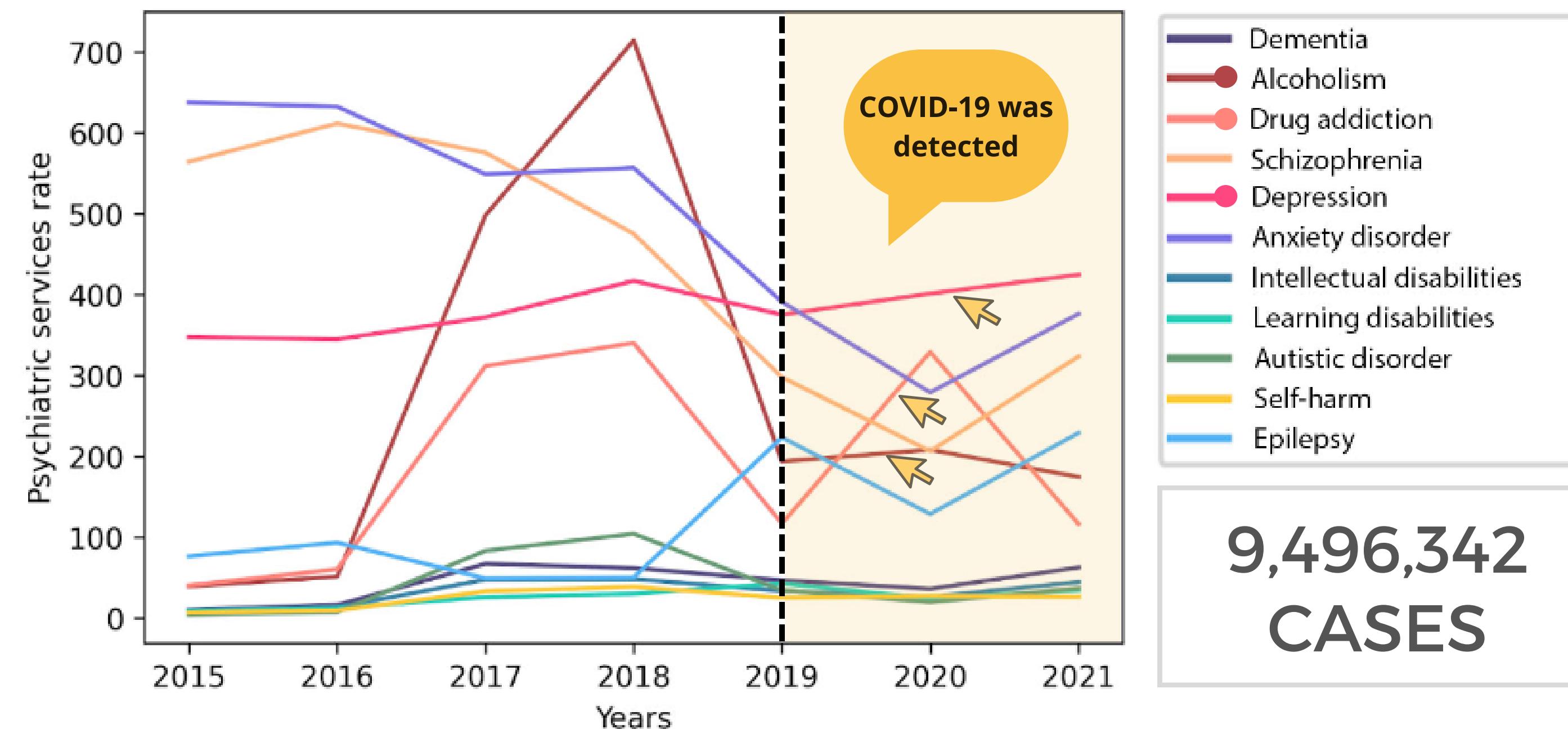


## 3.1 DESCRIPTIVE ANALYTICS



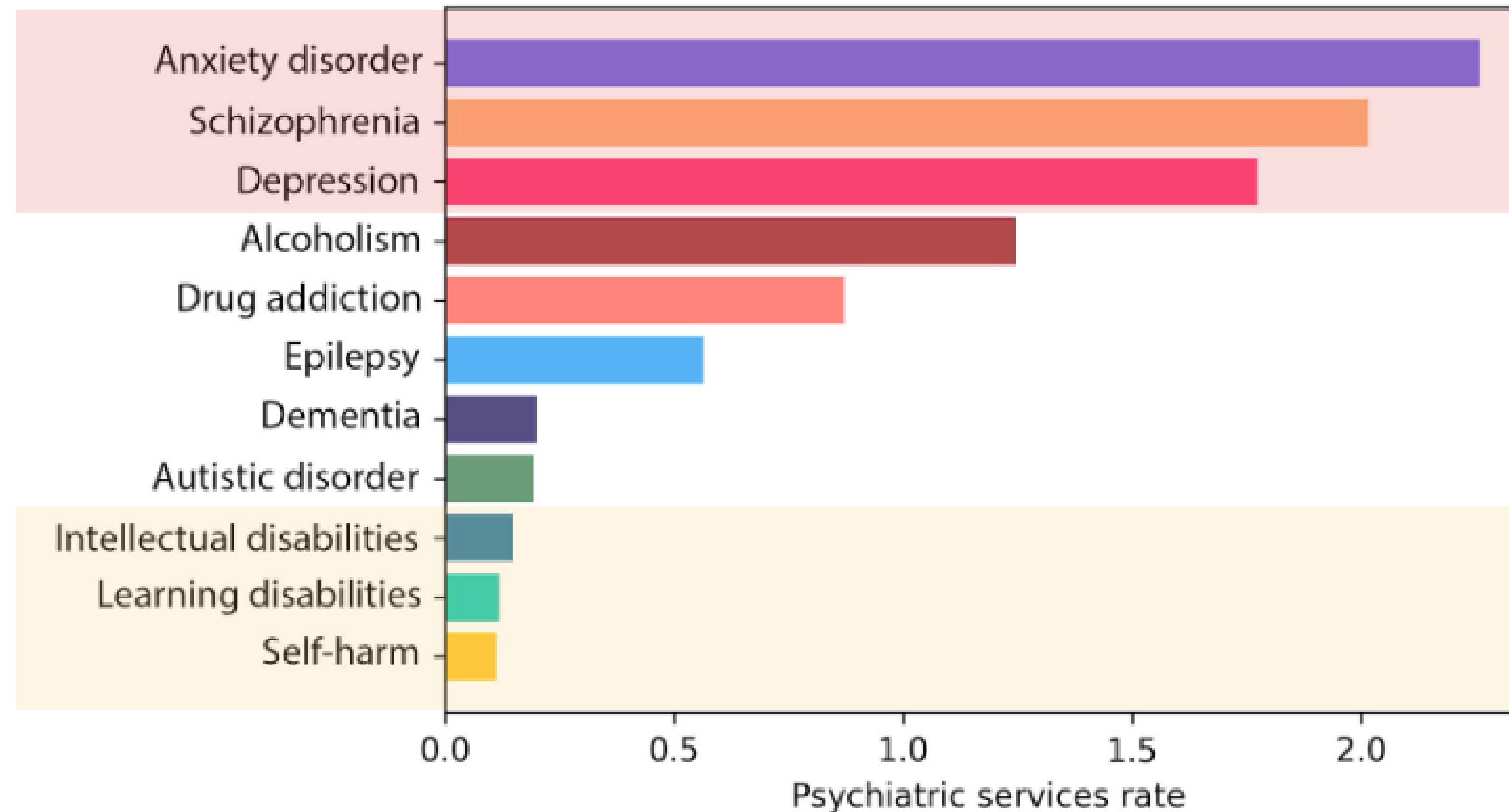
**FIGURE 2:** THE PATIENTS ACCESSING MENTAL HEALTH SERVICES RATE IN THAILAND SINCE 2015-2021 (PER 100K POPULATION).

## 3.1 DESCRIPTIVE ANALYTICS



**FIGURE 2:** THE NUMBER OF PATIENTS ACCESSING MENTAL HEALTH SERVICES IN THAILAND SINCE 2015-2021 (PER 100K POPULATION).

## 3.1 DESCRIPTIVE ANALYTICS

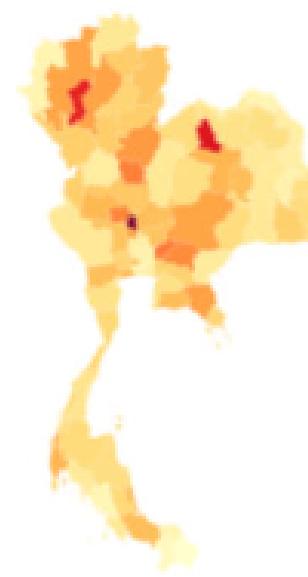


**FIGURE 3:** TOTAL OF THE NUMBER OF PATIENTS ACCESSING SERVICES IN THAILAND SINCE 2015-2021 (PER 100K POPULATION).

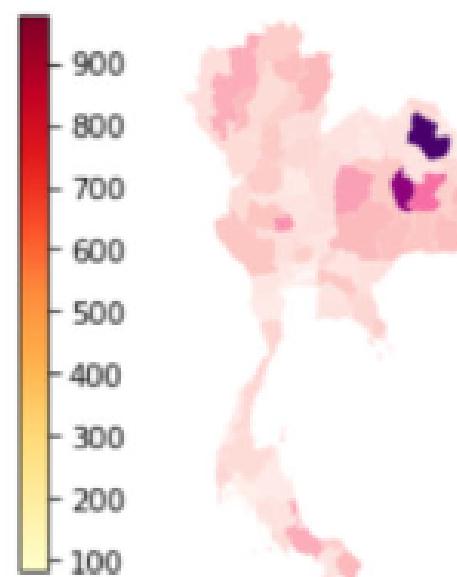
## 3.1 MAPPING

7  
YEARS

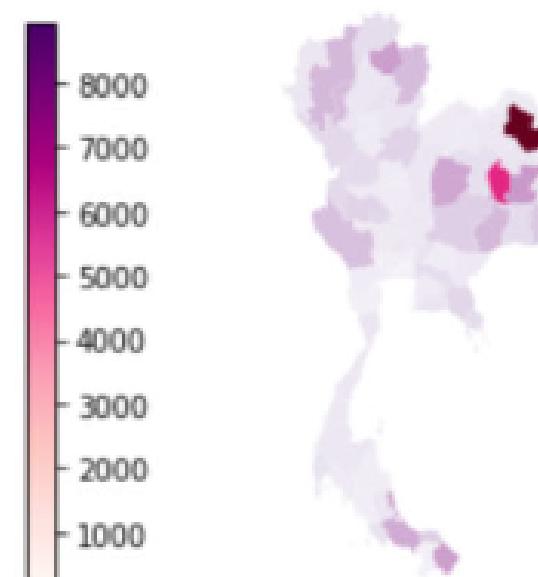
Total every years



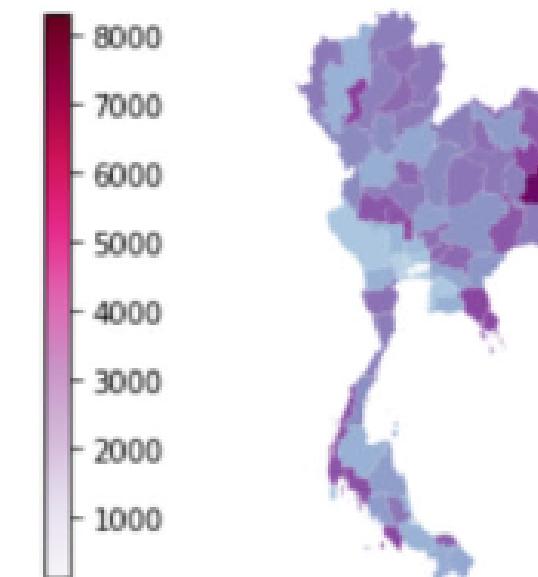
Dementia



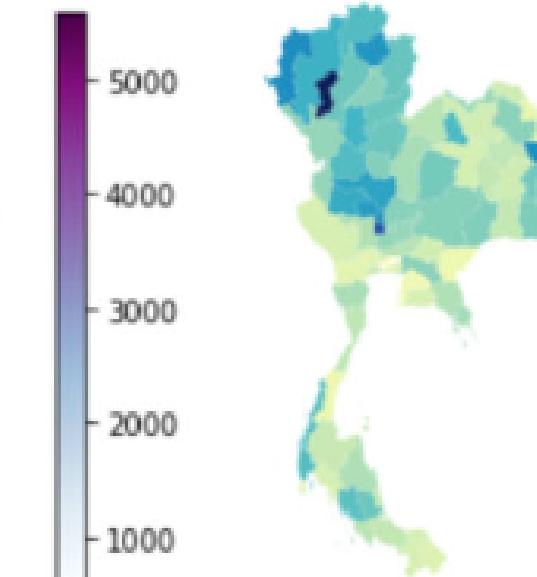
Alcoholism



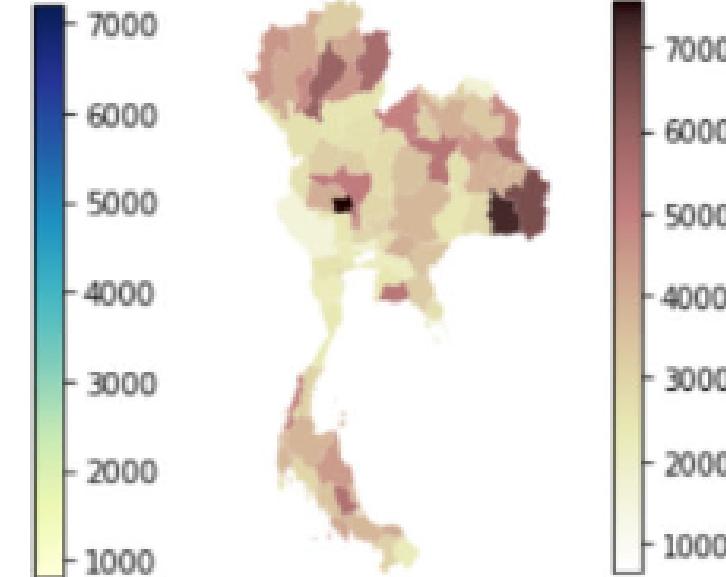
Drug addiction



Schizophrenia



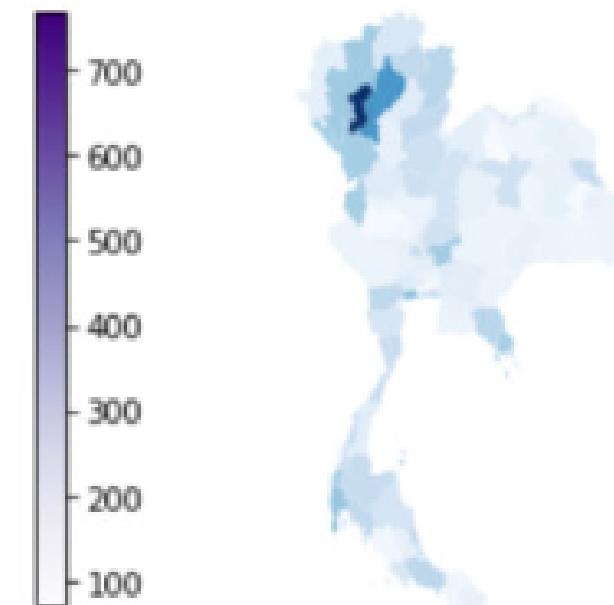
Depression



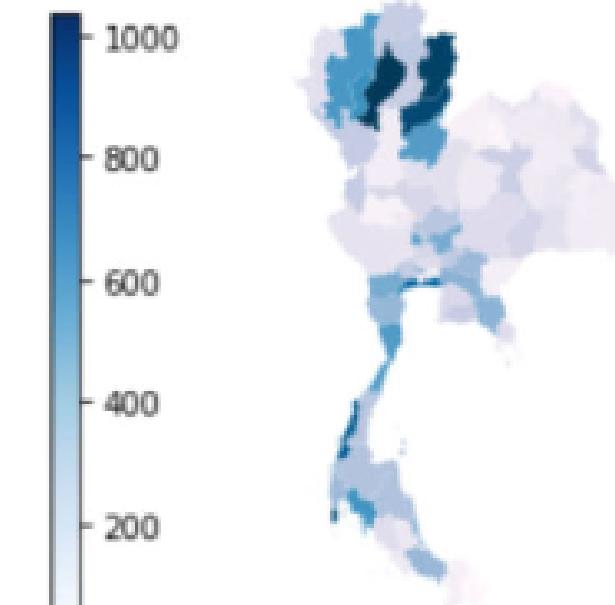
Anxiety Disorder



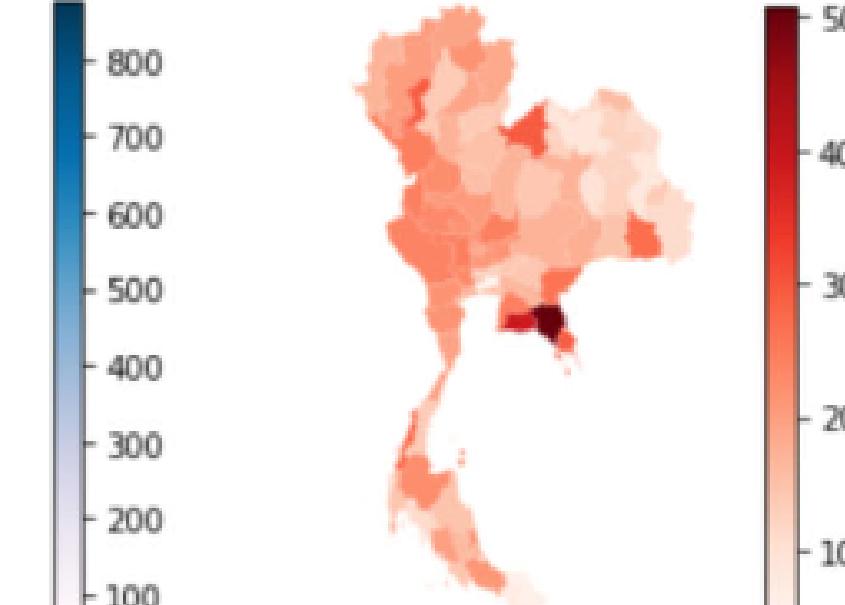
Intellectual disabilities



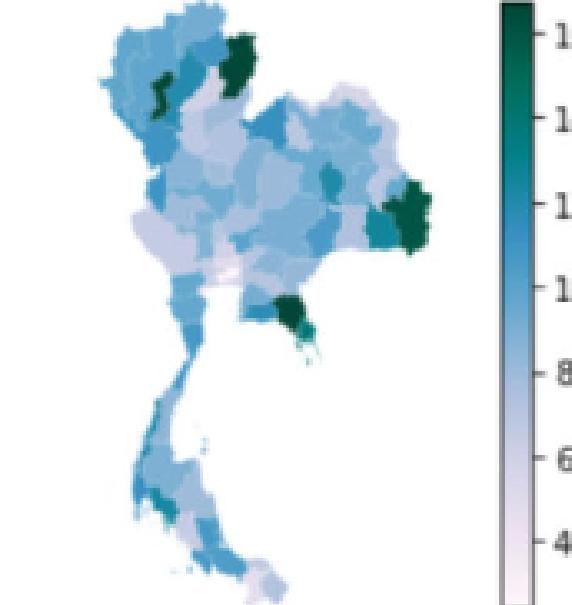
Learning disabilities



Autistic disorder



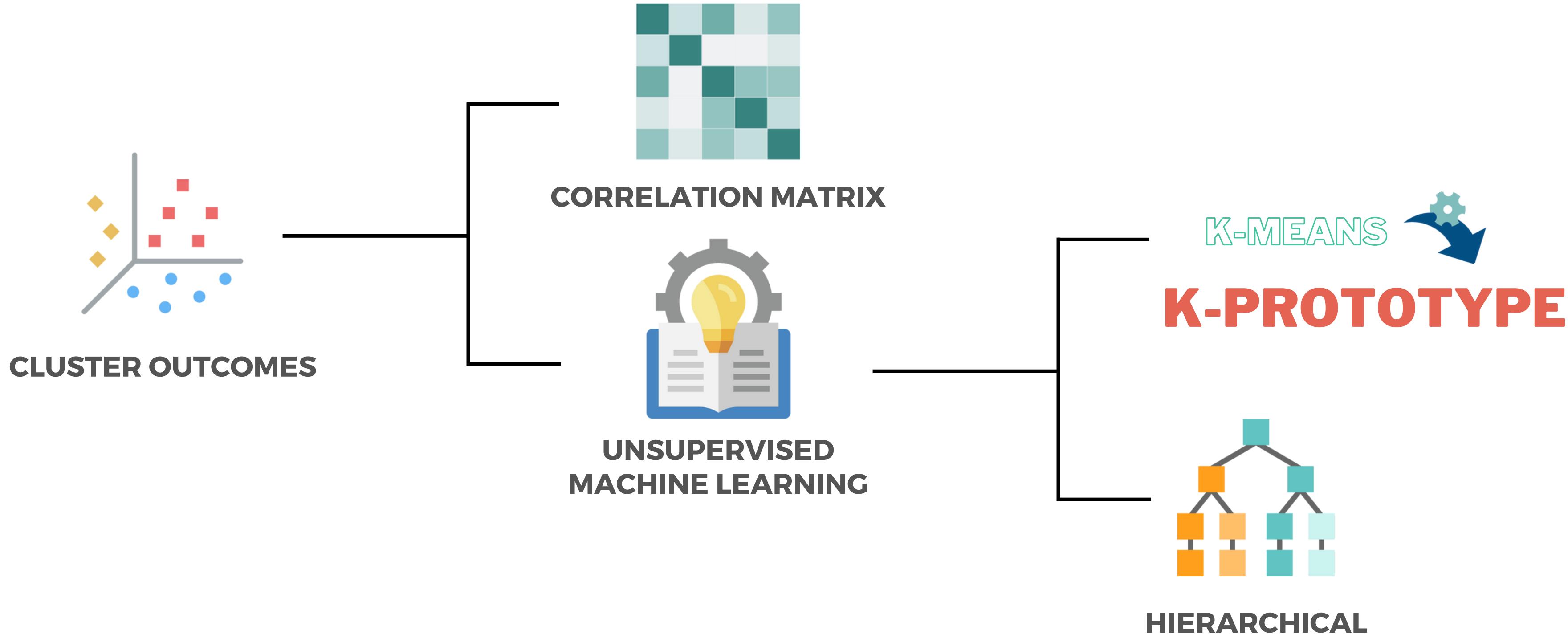
Epilepsy



Self-harm

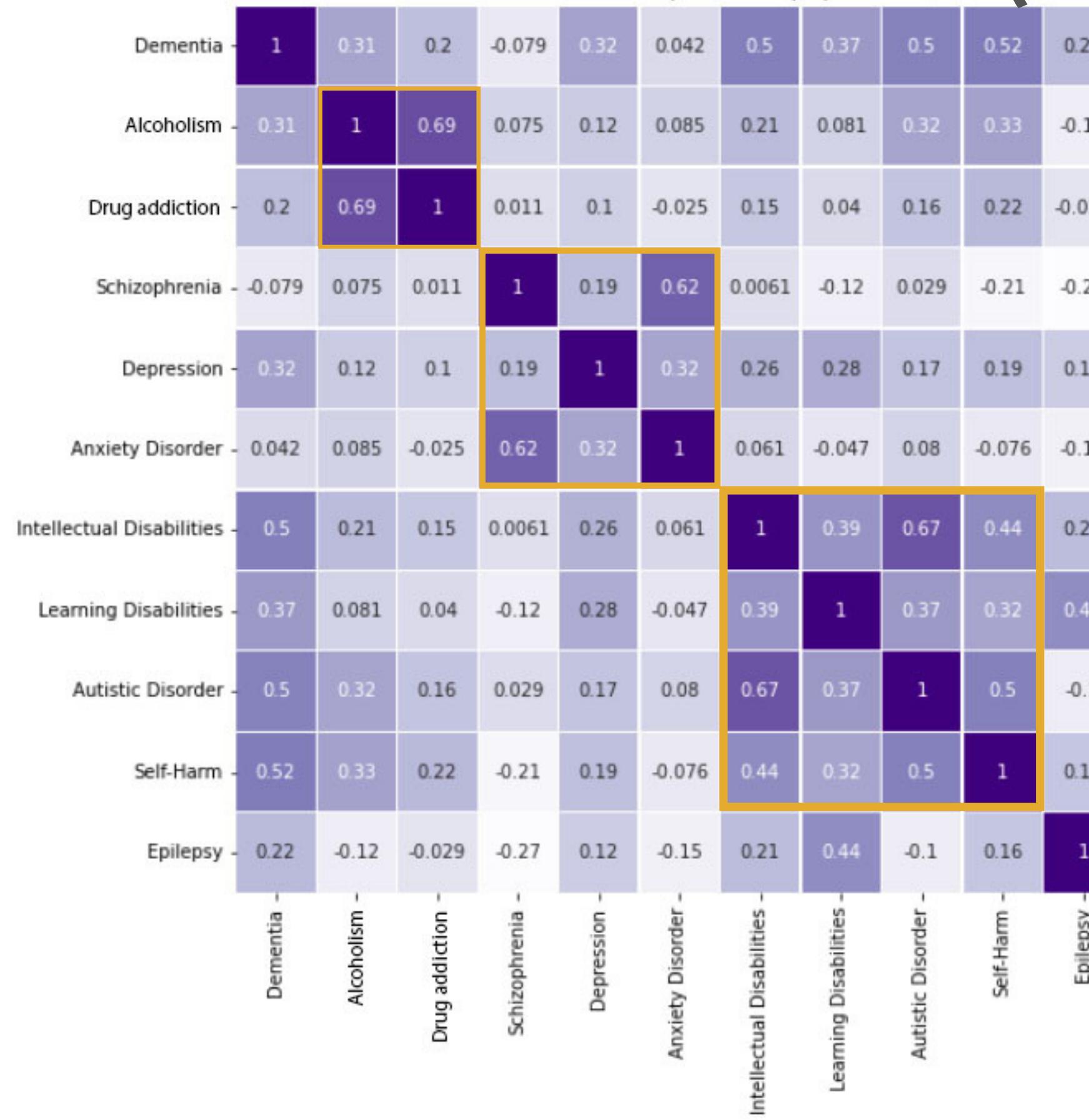
**FIGURE 4:** THE MAP SHOWS THE LOCATION OF MENTAL HEALTH SERVICES RATE AT REGION, NAMELY THE PROVINCES OF THAILAND, WHICH HAS A TOTAL OF 77 PROVINCES.

## 3.2 CLUSTERING OUTCOMES



Method of correlation: **spearman**

# CORRELATION MATRIX (TOTAL EVERY YEAR)



ALCOHOLISM  
DRUG ADDICTION

SCHIZOPHENIA  
DEPRESSION  
ANXIETY

INTELLECTUAL DISABILITIES  
LEARNING DISABILITIES  
AUTISTIC  
SELF HARM

# K-PROTOTYPE



Total every years

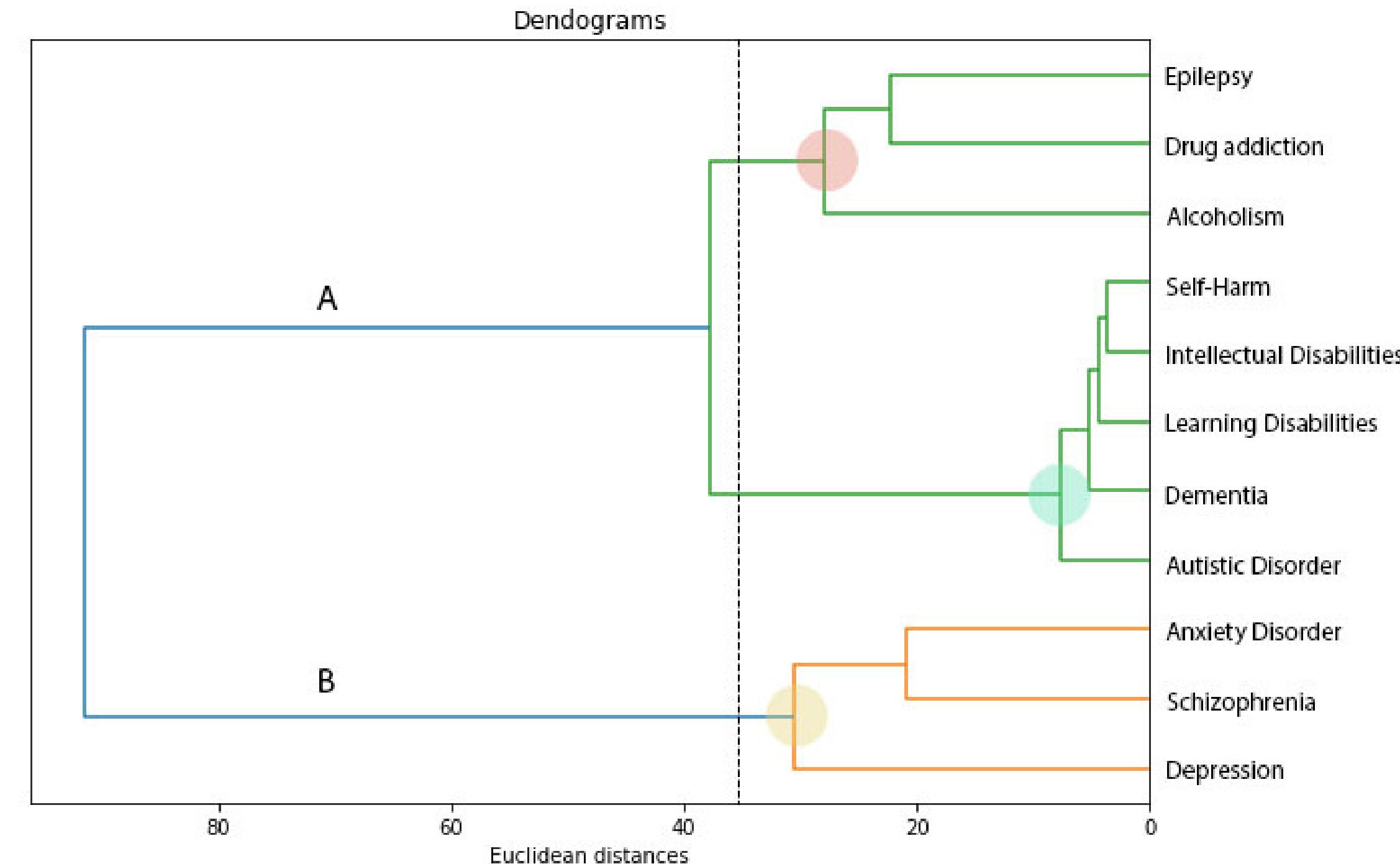
Schizophrenia  
Depression  
Anxiety Disorder

Dementia  
Intellectual Disabilities  
Learning Disabilities  
Autistic Disorder  
Self-Harm

Alcoholism  
Drug addiction  
Epilepsy

**FIGURE 6:** THE RESULT OF K-PROTOTYPE.

# AGGLOMERATIVE HIERARCHICAL



**FIGURE 7:** THE DENDROGRAM OF MENTAL DISORDER SHOWS TWO MAJOR BRANCHES: A AND B BY USING LINE CUT-POINT TO OBTAIN THREE CLUSTERS.

# AGGLOMERATIVE HIERARCHICAL



Total every years

Schizophrenia  
Depression  
Anxiety Disorder

Dementia  
Intellectual Disabilities  
Learning Disabilities  
Autistic Disorder  
Self-Harm

Alcoholism  
Drug addiction  
Epilepsy

**FIGURE 8:** THE RESULT OF HIERARCHICAL CLUSTERING.

### 3.3.1 GLOBAL SPATIAL DETECTION

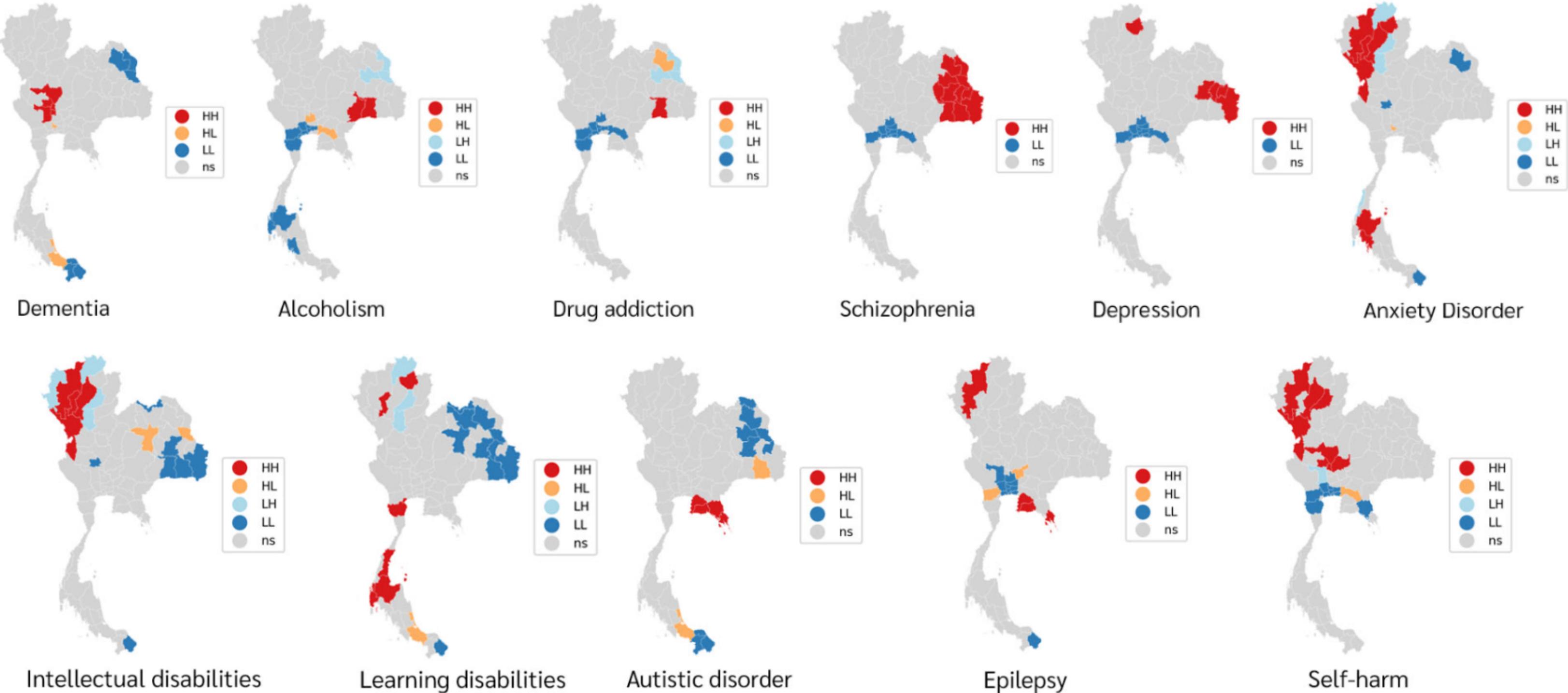


Total every years  
7 YEARS

Diorders	I	P-value	Interpretation
Dementia	0.18973	0.008	clustered
Alcoholism	0.06467	0.121	random
Drug addiction	0.02064	0.26	random
Schizophrenia	0.48678	0.001	clustered
Depression	0.29424	0.001	clustered
Anxiety Disorder	0.24519	0.001	clustered
Intellectual Disabilities	0.28906	0.001	clustered
Learning Disabilities	0.22704	0.004	clustered
Autistic Disorder	0.33164	0.001	clustered
Self-Harm	0.28466	0.001	clustered
Epilepsy	0.23111	0.004	clustered

**FIGURE 9:** THE VALUE AND P-VALUE OF MORAN'S I HYPOTHESIS TEST OF PATIENTS ACCESSING MENTAL HEALTH SERVICES IN THAILAND FOR A TOTAL OF 7 YEARS DURING 2015-2021 (PER 100K POPULATION).

## 3.3.2 LOCAL SPATIAL DETECTION



NOTE: FOR INTERPRETING CLUSTERS, HIGH-HIGH WERE LABELED BY RED, HIGH-LOW WERE LABELED BY YELLOW, LOW-HIGH WERE LABELED BY SKY BLUE, LOW-LOW WERE LABELED BY BLUE AND NOT SIGNIFICANT WERE LABELED BY GRAY.

## 3.3.2 LOCAL SPATIAL DETECTION

### Northern

Depression  
Anxiety Disorder  
Intellectual Disabilities  
Learning Disabilities  
Autistic Disorder  
Self-Harm  
Epilepsy



### Northeastern

Schizophrenia  
Depression  
Drug addiction  
Alcoholism



### Central

Dementia  
Self-Harm



### Southern

Anxiety Disorder  
Learning Disabilities



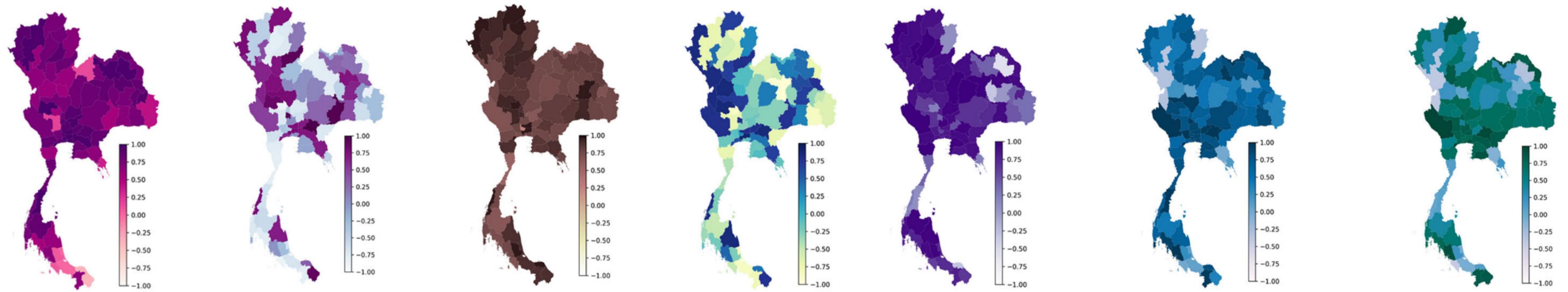
### Eastern

Autistic Disorder  
Epilepsy



### 3.3.3 DISORDER PAIRS

MAP OF SPEARMAN'S CORRELATION OF DISORDER PAIRS OF THE NUMBER OF PATIENTS ACCESSING MENTAL HEALTH SERVICES IN THAILAND AT THE PROVINCIAL LEVEL FOR A TOTAL OF 7 YEARS (2015-2021).



**DRUG ADDICTION & ALCOHOLISM**

**SCHIZOPHRENIA & DEPRESSION**

**SCHIZOPHRENIA & ANXIETY**

**DEPRESSION & ANXIETY**

**AUTISTIC DISORDER & INTELLECTUAL DISABILITIES**

**AUTISTIC DISORDER & LEARNING DISABILITIES**

**INTELLECTUAL DISABILITIES & LEARNING DISABILITIES**

Corr : 0.69

Corr : 0.19

Corr : 0.62

Corr : 0.32

Corr : 0.67

Corr : 0.37

Corr : 0.39

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# 04 DISCUSSION AND CONCLUSION

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OUTCOMES

2

CLUSTERING  
OUTCOMES

3

LIMITATIONS

4

CONCLUSION

# 04.1 SPATIAL OUTCOMES



## DEPRESSION

Major clusters in several northern provinces -> Seasonal Affective Disorder (SAD)\*



## DRUG ADDICTION

The drug epidemic and a large number of drug-addiction patients in the north -> the smuggling of drugs from neighboring countries\*\*



## ANXIETY DISORDERS

Mostly found in the Northeast -> cortisol hormones\*\*\*

\* What Is Seasonal Affective Disorder (SAD)? [\\*\\* Jandeang, Burachat. "Analysis of Current Drug Situation Problem." Journal of Research and Development Institute, Rajabhat Maha Sarakham University, vol. 4\(2\), 2017, pp. 37–56.](https://www.mind.org.uk/information-support/types-of-mental-health-problems/seasonal-affective-disorder-sad/about-sad/#:~:text=Treatment-,What%20is%20seasonal%20affective%20disorder%20(SAD)%3F, and%20affects%20your%20everyday%20life. Accessed 24 July 2022.</a></p></div><div data-bbox=)

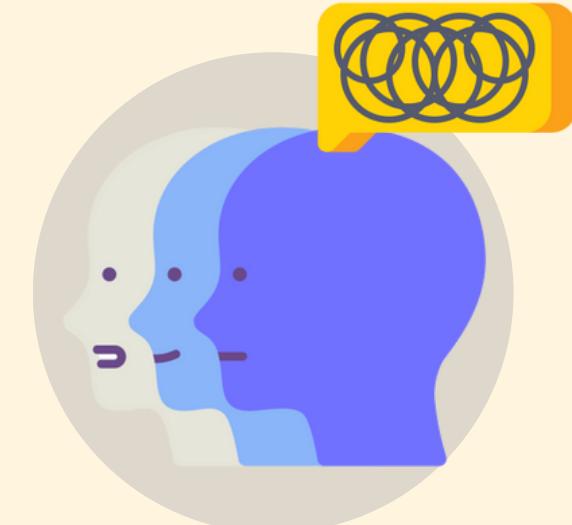
\*\*\* Geall, Lauren, and Moya Crockett. "You're Not Imagining It: Hot Weather Really Can Make Anxiety Worse – Here's How to Deal with It." Stylist, The Stylist Group, 18 July 2022, <https://www.stylist.co.uk/life/summer-anxiety-makes-worse-heat-wave-social-causes-symptoms-advice/219735>.

# 04.2 CLUSTERING OUTCOMES



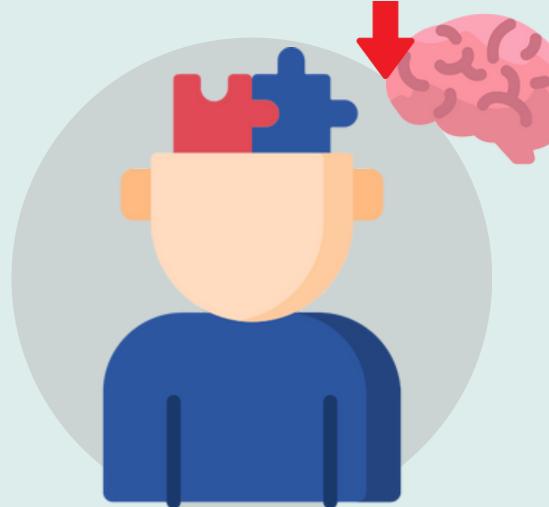
## ADDICTION GROUP

- Abusing **alcohol** has a potential risk of other **substance use**.\*
- The prevalence of **epilepsy** among alcoholics is at least triple that in the general population.\*



## MOOD DISORDER GROUP

- **Anxiety disorders** are higher in **schizophrenia** than in the general population and may occur after treatment for schizophrenia due to concerns in daily life.\*\*



## BRAIN DISORDER GROUP

- **Intellectual disabilities** are the most common co-occurring with **Autistic disorder**.\*\*\*
- **Autistic disorder** had 2.26-times higher odds of **self-harm** than those without Autistic disorder.\*\*\*

\* Galbicsek, Carol. "Drinking And Drugs." Alcohol Rehab Guide, <https://www.alcoholrehabguide.org/alcohol/drinking-drugs/>. Accessed 19 July 2022.

\*Chan, Arthur W. K. "Alcoholism and Epilepsy." *Epilepsia*, vol. 26, no. 4, 1985, pp. 323–33, <https://doi.org/10.1111/j.1528-1157.1985.tb05658.x>.

\*\* Chaudhury, Suprakash, and Chandra Kiran. "Prevalence of Comorbid Anxiety Disorders in Schizophrenia." *Industrial Psychiatry Journal*, vol. 25, no. 1, 2016, p. 35, <https://doi.org/10.4103/0972-6748.196045>.

\*\*\* Blanchard, Ashley, et al. "Risk of Self-Harm in Children and Adults With Autism Spectrum Disorder: A Systematic Review and Meta-Analysis." *JAMA Network Open*, vol. 4, no. 10, Oct. 2021, p. e2130272.

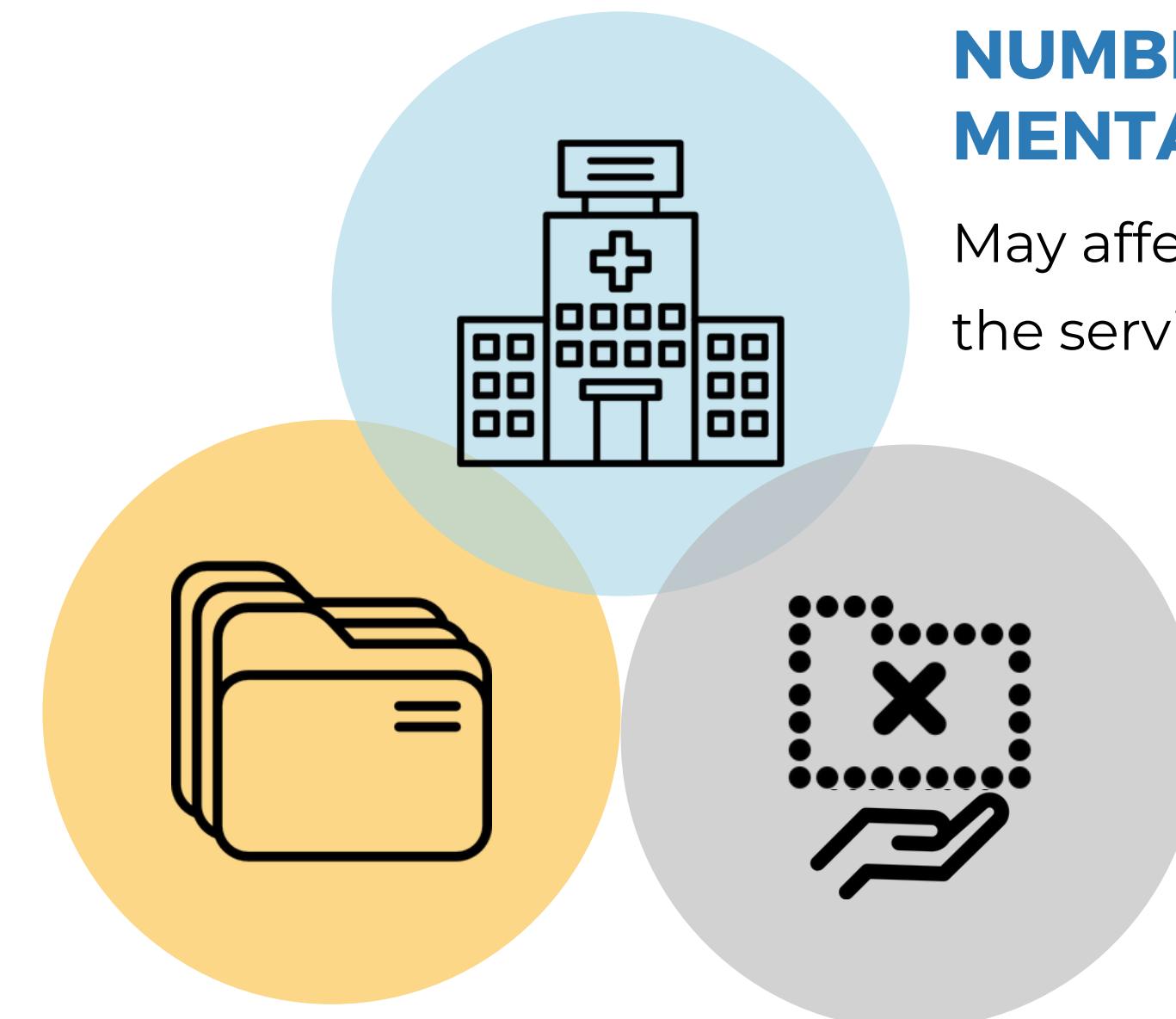
\*\*\* Matson, Johnny L., and Mary Shoemaker. "Intellectual Disability and Its Relationship to Autism Spectrum Disorders." *Research in Developmental Disabilities*, vol. 30, no. 6, 2009, pp. 1107–14, <https://doi.org/10.1016/j.ridd.2009.06.003>.

## 04.3 LIMITATIONS

### DATA SOURCE

A mental health accessed services report.

Stigmatization may prevent patients from seeking treatment.



### NUMBER AND LOCATION OF MENTAL HEALTH SERVICES

May affect the difficulty of accessing the service.

### MISSING DATA

Bangkok Metropolis's mental health accessed services data was missing in 2017.

# 04.4 CONCLUSION

This study aims to...



## GOVERNMENT POLICIES

May advocate government policies that allocate resources to those regions where people seek mental health services.



## REALIZE THE IMPORTANCE

Help Thai people realize the importance of mental disorders.



## OVERVIEW OF MENTAL HEALTH

See an overview of mental health in Thailand.

# PERSONAL EXPERIENCES FROM WIL



Mental disorders are actually very common.



Mental illnesses are all around us and can affect anyone.

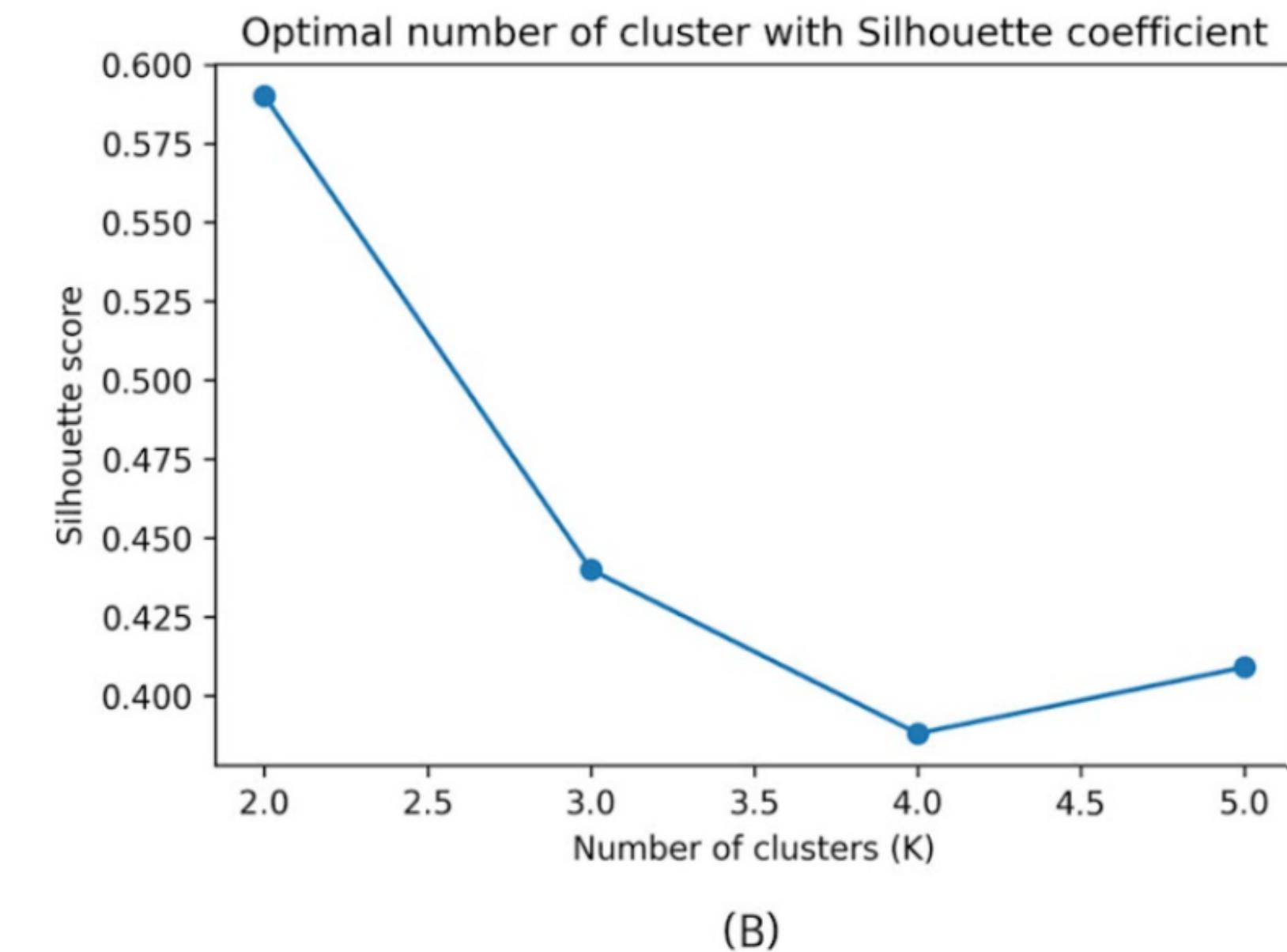
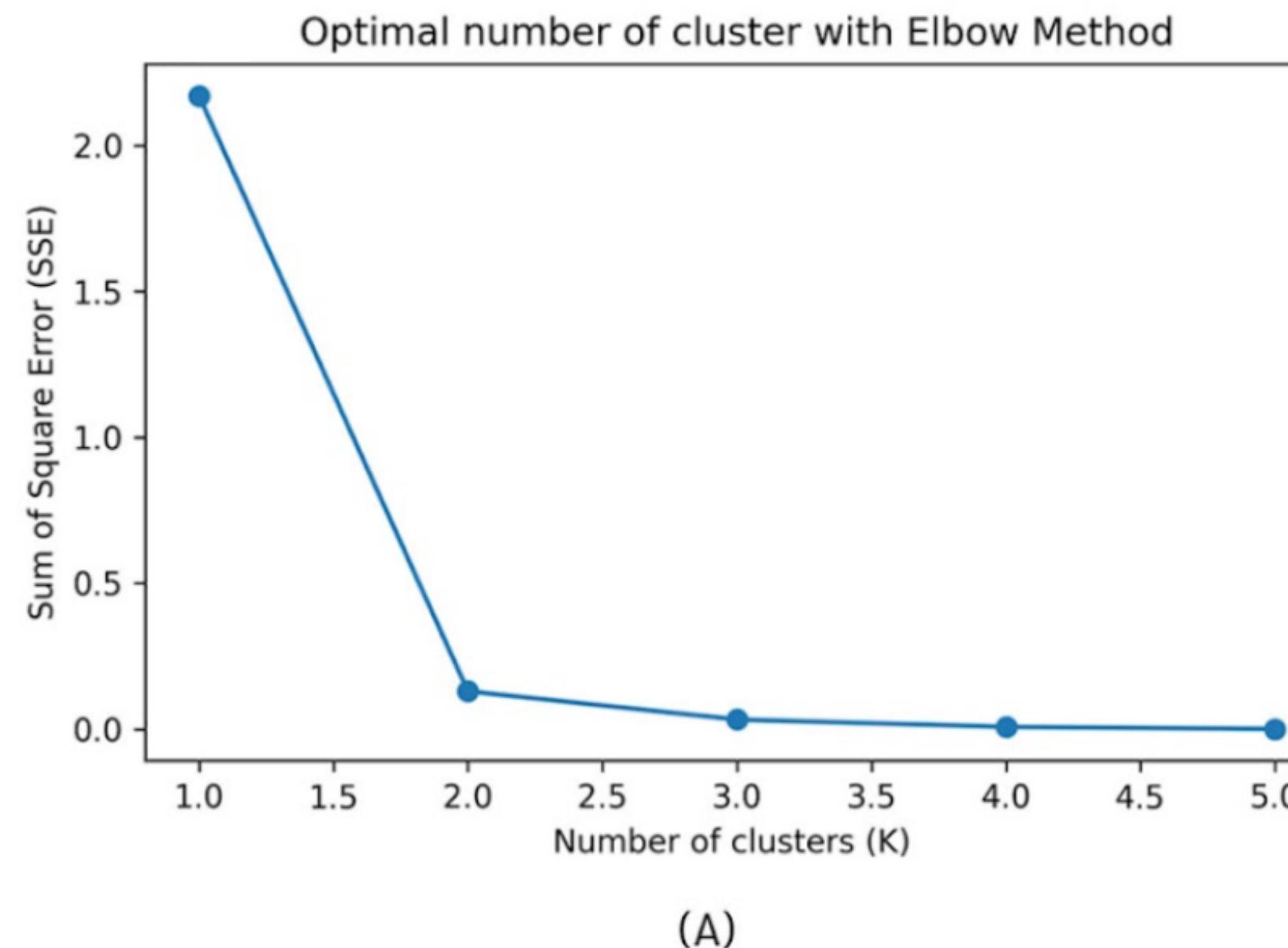
# Q&A

**THANKS  
FOR YOUR  
ATTENTION**



# **BACK SLIDE**

# K-PROTOTYPE



**FIGURE 6:** THE RESULTS OF (A) FINDING THE OPTIMAL NUMBER OF CLUSTERS FOR K-PROTOTYPE CLUSTERING USING ELBOW METHOD AND (B) SILHOUETTE COEFFICIENT.

### 3.3.3 DISORDER PAIRS

#### Northern

- Alcoholism
- Drug addiction
- Schizophrenia
- Anxiety Disorder
- Intellectual Disabilities
- Learning Disabilities
- Autistic Disorder

#### Northeast

- Alcoholism
- Drug addiction
- Schizophrenia
- Anxiety Disorder

#### Central

- Autistic Disorder
- Intellectual Disabilities
- Autistic Disorder
- Learning Disabilities
- Intellectual Disabilities
- Learning Disabilities

#### Southern

- Autistic Disorder
- Intellectual Disabilities
- Autistic Disorder
- Learning Disabilities
- Intellectual Disabilities
- Learning Disabilities

#### Eastern

- Schizophrenia
- Depression
- Depression
- Anxiety Disorder

#### Western

- Schizophrenia
- Depression
- Depression
- Anxiety Disorder