

Background

Undiagnosed chronic conditions can profoundly impact health outcomes negatively. Identifying coexisting patterns among these conditions holds significant potential for prevention and early diagnosis strategies.

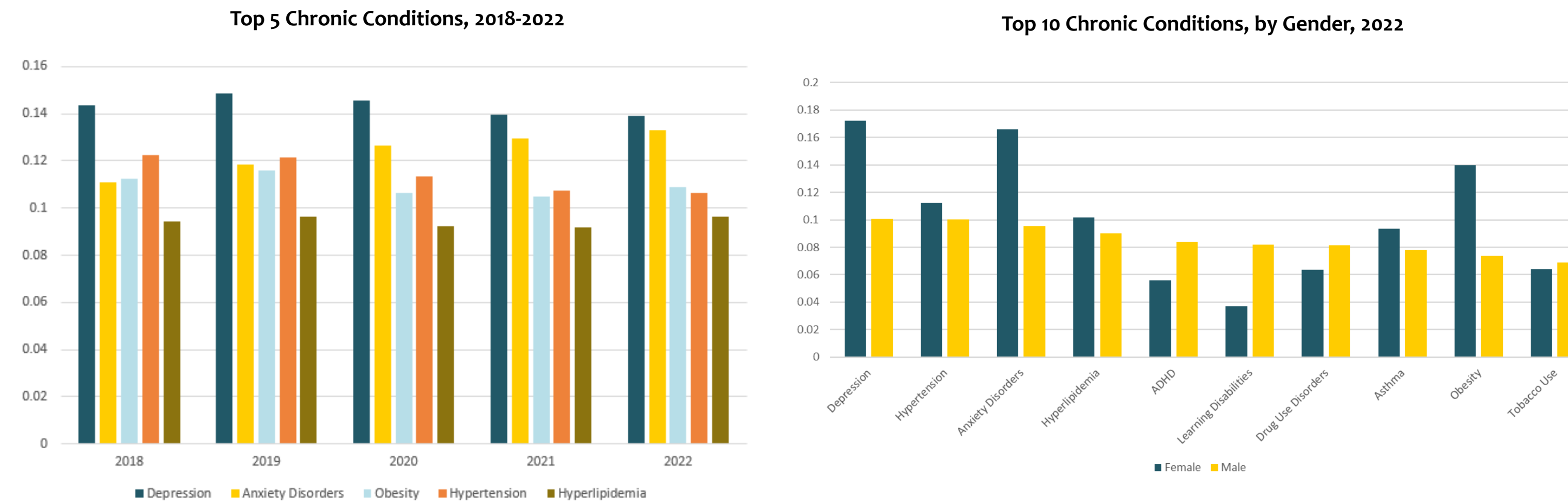
Research Objectives

- Find coexisting patterns of multiple chronic conditions with a focus on anxiety in the context of 63 chronic conditions.
- Verify the accuracy of the learned association rules.

Study Design

- Analytic technique: association rule learning
- Cohort
 - Maryland full-benefit Medicaid enrollees, 2018-2022
 - Stratified by gender (female, male) and age groups (child: <18 years; young adult: 18-44 years; middle-aged: 45-64 years)
- Data source
 - Maryland Medicaid MMIS2 claims database
- Chronic condition
 - 63 chronic conditions, definitions follow Chronic Conditions Data Warehouse (CCW)¹

Chronic Condition Prevalence



Across five years, depression was the most prevalent condition.

Anxiety, depression, and obesity rates were higher for females than for males.

Conclusions

- The non-dual-eligible, full-benefit Maryland Medicaid population had 546 association rules when focusing on anxiety.
- Validation test on holdout data shows accurate prediction on the association rules.
- Data mining might be a useful technique to extract insights from big data to identify undiagnosed chronic conditions.

Policy Implications

- Health care providers can more accurately assess the likelihood of coexisting health issues.
- Enhanced awareness facilitates earlier diagnosis or prevention of additional health issues.
- The study lays the groundwork for a new clinical decision support platform aiming to revolutionize chronic disease care by providing clinicians with advanced predictive tools.

Top 5 Association Rules for Middle-Aged Females

Antecedent	Consequents	Number of Cases	Confidence	Lift	Confi. Calibration
ADHD, Depression	Anxiety	19,609	0.83	3.57	0.80
Bipolar Disorder, Drug Use Disorders, Fibromyalgia	Anxiety	3,704	0.80	3.46	0.82
Alcohol Use Disorders, Depression, Drug Use Disorders	Anxiety	8,381	0.78	3.37	0.77
Bipolar Disorder, Depression, Drug Use Disorders, Tobacco Use	Anxiety	8,709	0.78	3.37	0.76
Bipolar Disorder, Drug Use Disorders, Tobacco Use	Anxiety	8,804	0.78	3.37	0.75

Association Rule:
(ADHD, Depression) → Anxiety

When a middle-aged female has ADHD and depression

- The probability of coexisting anxiety condition is 0.83.
- This rule is calculated from 19,609 cases.
- When this rule is tested in holdout data set, the calculated confidence is 0.80.
- Individuals who experience ADHD and depression are 3.57 times more likely to also experience anxiety compared to what would be expected if the occurrence of depression and anxiety were independent of each other.

Limitations

- Finding spurious or irrelevant associations that are statistically significant but trivial.
- Facing challenges when handling large data sets due to significant computational complexity and extensive memory demands. Leveraging cloud computing resources can mitigate these limitations by providing scalable processing power and storage capacity.

Acknowledgments and References

Funding for this research is from the Maryland Department of Health.

1. <https://www2.ccwdata.org/web/guest/condition-categories>