To better manage staffing, a treatment provider asks a data scientist:

Are worse winters predictive of alcoholism?

Ross Brown Data Science and Psychometrics

Managing Staffing Levels is Critical for Twin Towns Substance Abuse Treatment Network

- Labor biggest expense.
- Need to balance sufficient staffing for quality care and preventing employee burnout with costs of overstaffing
- Need to predict patient demand in new markets for corporate expansion

Why winter weather may predict alcoholism:

Seasonal Affective Disorder (SAD)

Depression-like mood disorder associated with winter weather features:

- Shorter days
- Reduced sunshine
- Isolation

Research has shown that SAD is related to and possibly predictive of alcoholism

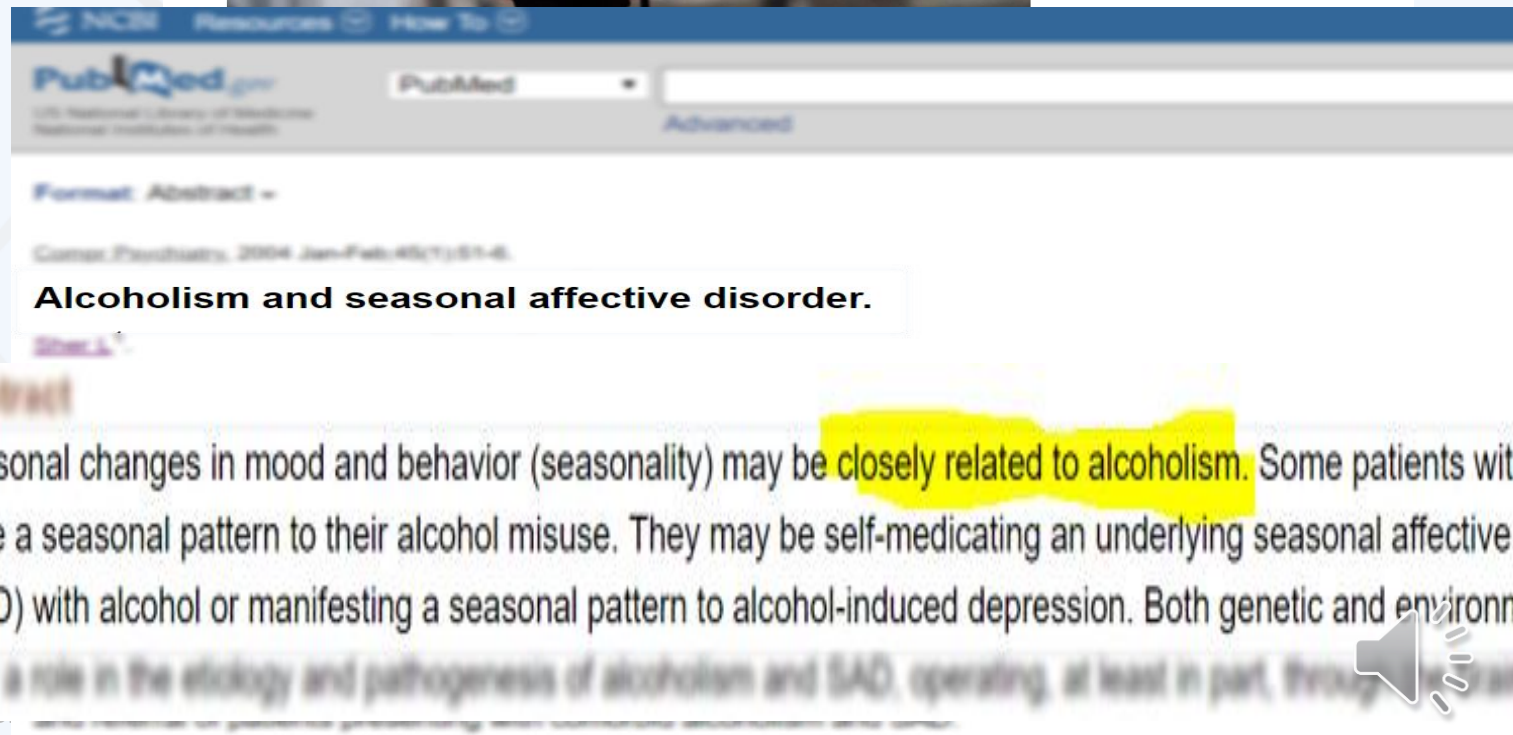

BUSINESS INSIDER

TECH FINANCE POLITICS STRATEGY LIFE INTELLIGENCE ALL

People with seasonal affective disorder could be more at risk of becoming alcoholics — here's why

Lindsay Dodgson Oct. 13, 2017, 3:45 AM

RECOMMENDED FOR YOU


PubMed

Format: Abstract

Alcoholism and seasonal affective disorder.

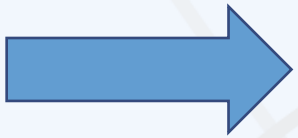
Abstract

Seasonal changes in mood and behavior (seasonality) may be closely related to alcoholism. Some patients wit have a seasonal pattern to their alcohol misuse. They may be self-medicating an underlying seasonal affective (SAD) with alcohol or manifesting a seasonal pattern to alcohol-induced depression. Both genetic and environ play a role in the etiology and pathogenesis of alcoholism and SAD, operating, at least in part, through

Winter = SAD = Alcoholism

Winter is ***Harsher***,

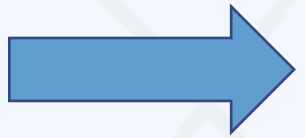
More ***Severe***



Seasonal Affective Disorder

is more ***Widespread*** and/or

more ***Severe***



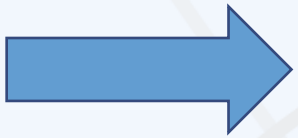
More

Alcoholism

Winter = Alcoholism

Winter is ***Harsher***,

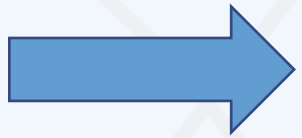
More ***Severe***



Season isorder

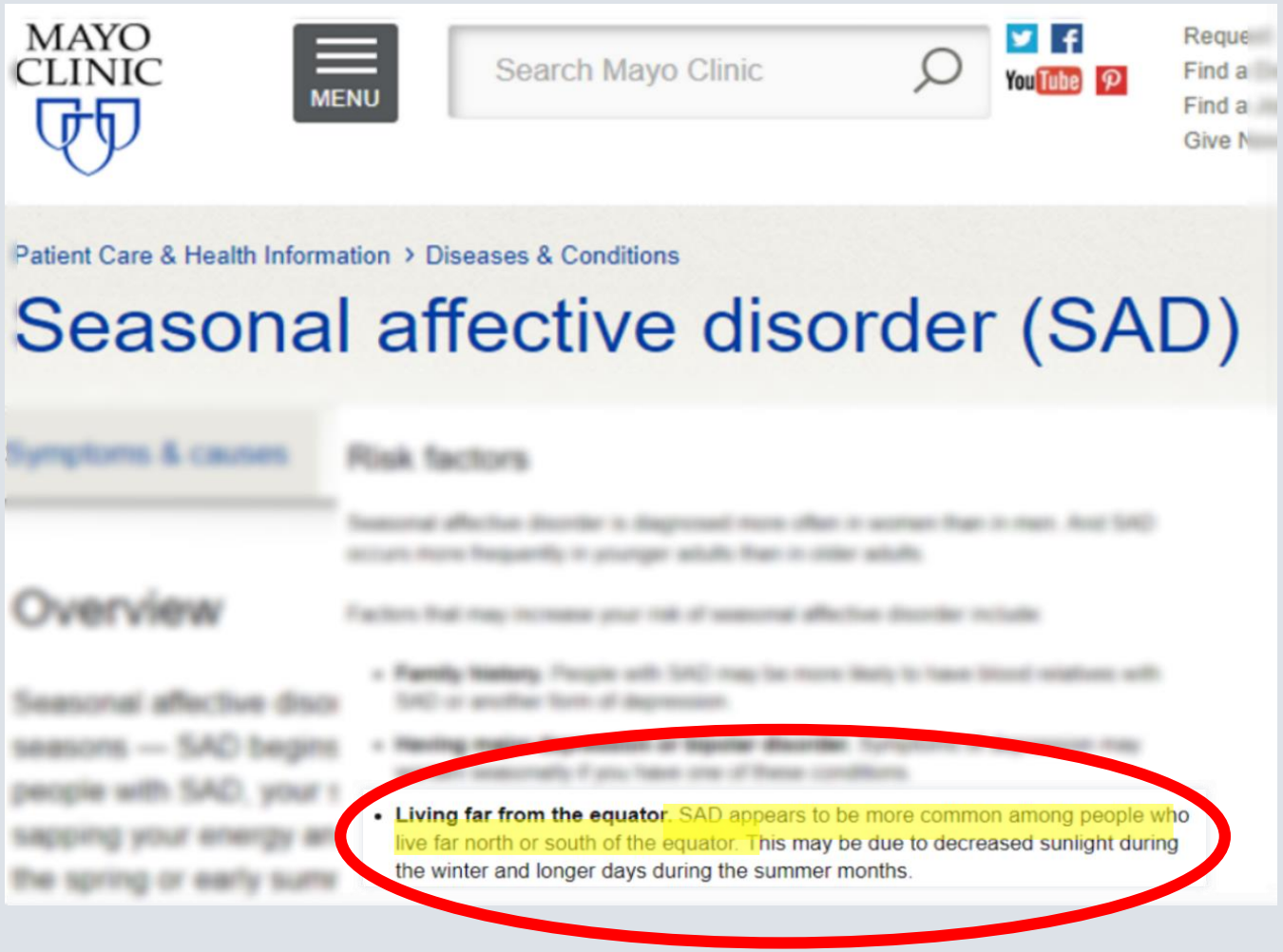
is more and/or

more ***Severe***



More

Alcoholism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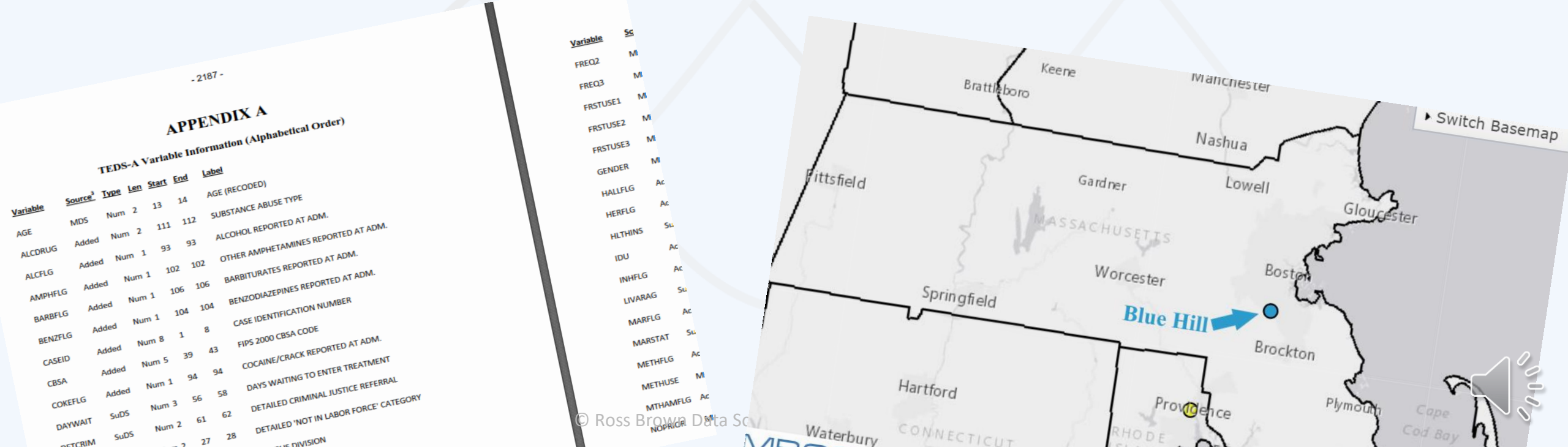
Seasonal affective disorder (SAD)
Symptoms & causes
Risk factors
Overview
Living far from the equator. SAD appears to be more common among people who live far north or south of the equator. This may be due to decreased sunlight during the winter and longer days during the summer months.

The Study Plan and the Data

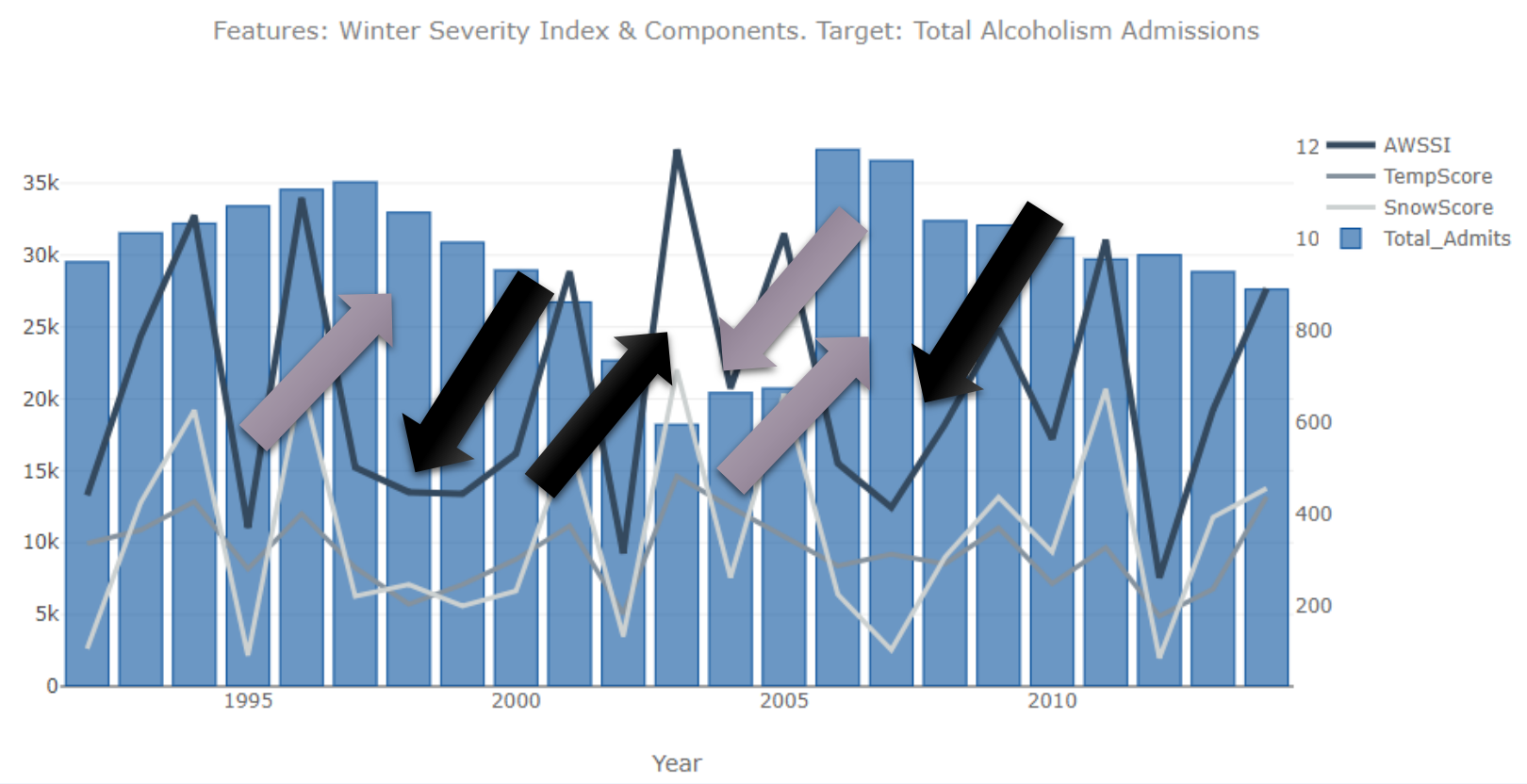
- Pilot study: manage costs but create meaningful, generalizable findings
- Alcoholism admissions: Massachusetts data from a comprehensive census of annual admissions to substance abuse treatment facilities from 1992 – 2014.
- Weather: A winter severity index as reported in Blue Hill, Massachusetts



Findings: Winter Severity Index and Alcoholism

Winter severity index (AWSSI) is comprised of overall severity, snow component, temperature component.

- What does it look like when plotted against alcohol admissions?
- The height of bars are the number of alcoholism admissions, the lines are the winter severity and components.



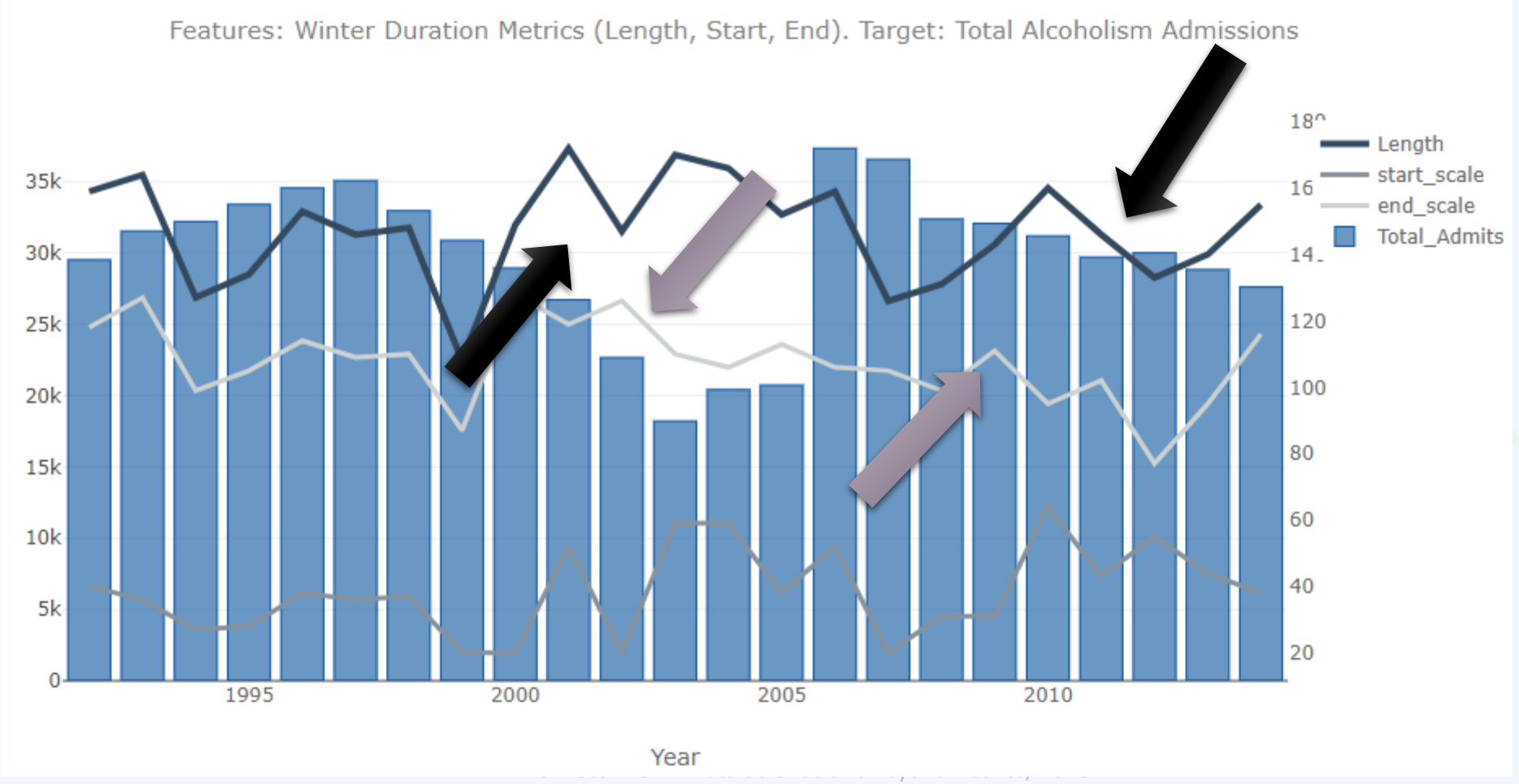
A pattern emerges,

One that is repeated,

And is also reversed

Moderate, negative relationship between winter severity and alcoholism

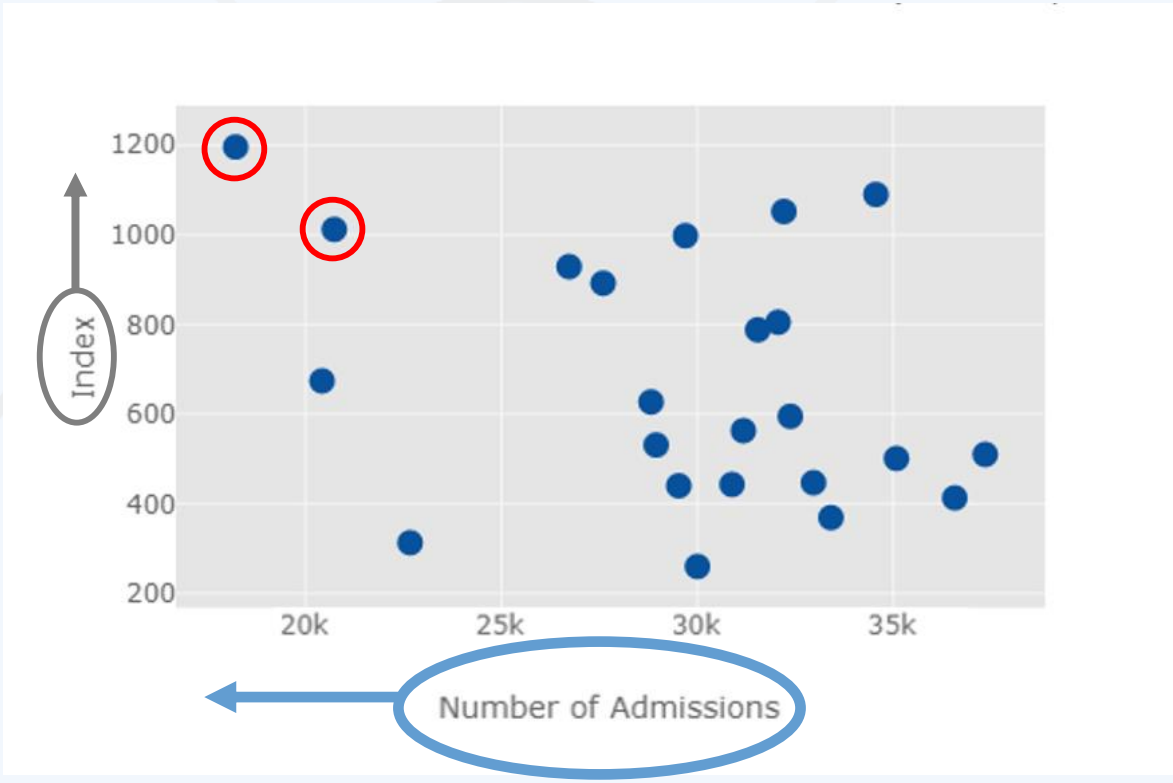
- For winter duration metrics – start date, end date and length – the effect was much less pronounced



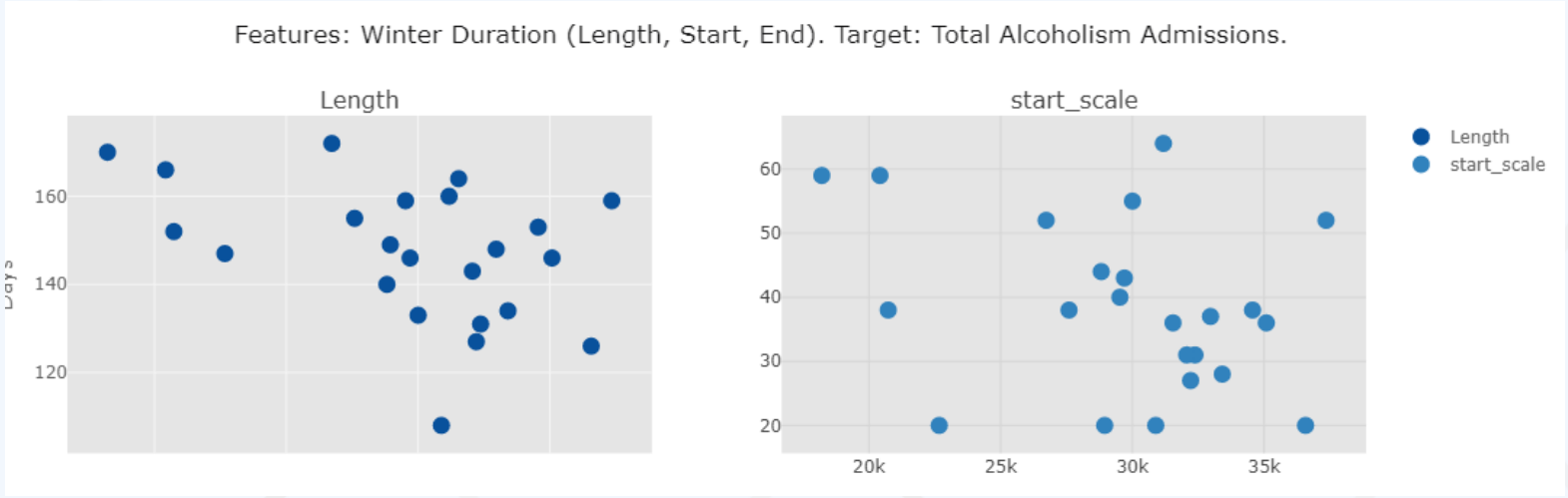
Other data visualizations showed same relationships

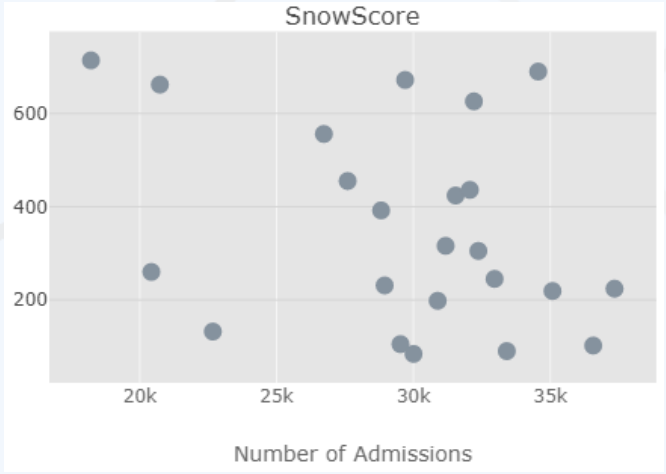
Scatterplot, where each dot represents one year:

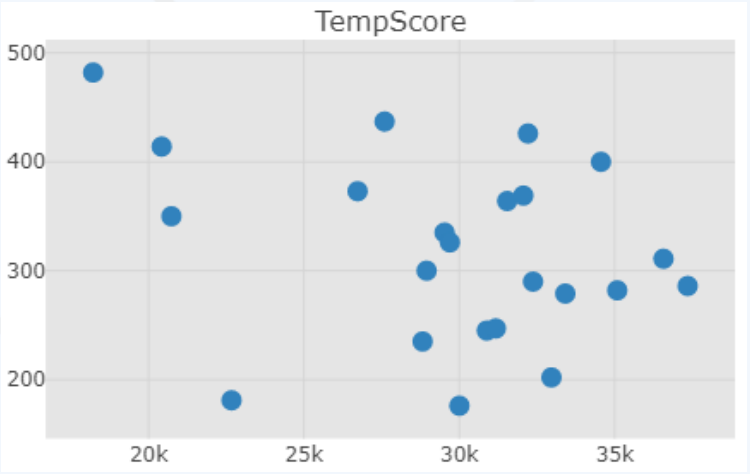
- As winter severity *INCREASES* on the vertical axis,
- the number of admissions, on the horizontal axis, *DECREASES*.



Across winter severity metrics:
Same moderate *negative* relationship







Initial data visualization: Revise hypothesis

- Relationship appears to be reversed.
- *Milder* winter weather coincides with more alcoholism admissions.
- We can make predictions from negative relationships
- Let's look as some numbers describing these negative relationships

Correlations:

Quantifying degree to which alcohol admits increase as winter severity decreases:

- Negative correlation (i.e., −0.3) means one goes up while the other goes down.

- We have mostly negative relationships between alcohol admissions and its subgroups and the winter weather severity measures.

- **Darker the** cell color, the greater the relationships.

Correlations:

Quantifying degree to which alcohol admits increase as winter severity decreases:

NOT A LOT

- Correlation of −1.0 indicates a perfect, +to −1, relationship.

- Length and start scale have the strongest negative correlations, for total admissions and subgroups.

- Relationships shown here are weak.

Making predictions: Problematic data

The likelihood a predictive algorithm could be developed was reduced because of:

A. Characteristics of the **data**:, i.e., only 23 data points.

B. Characteristics of the **outcome** we were attempting to predict, i.e., a large numerical range.

Taken together:

A. Hampered our ability to reliably **replicate and verify** any observed effects.

B. All applicable techniques **failed** to produce a usable predictive result.

The consistent, observable relationship between winter severity and alcoholism intake didn't have enough predictive power when applied to a population.

Conducting all regression analyses models did lead to findings that could be implemented

Nonetheless, this study provides TT with meaningful, actionable information

Project implications

- Found evidence of a relationship between winter severity and alcoholism
- Opposite of expectation; a reconceptualization of the dynamics may emerge.
- Perhaps more severe winters spur people to alleviate isolation by seeking out socialization. The effect of active engagement with others may be a counterweight to any increase in seasonal affective disorder brought on by a harsh winter.
- If future studies find consistent and/or greater evidence of the effect found with this data, winter weather may join unemployment and marital status as an external factor understood to be an important element of alcoholism epidemiology.

The following slides describe specific ways TT can apply the study findings

Twin Towns has clear direction to answer its initial business questions:

Can we save money, improve staff morale and patient outcomes, and target markets for expansion using winter severity data?

If so, how?

Step 1:

A critical and affordable early step would tell Twin Towns whether the weak-to-moderate winter severity/alcoholism relationship will have any bearing on its costs, staff morale, and patient treatment outcomes. Overlaying the publicly available winter severity data with its own patient admissions, staffing needs would tell Twin Towns whether the benefits in these areas are limited to the margins, or are worth making changes to achieve these operational benefits.

Putting findings into action: Low-cost and effective steps requiring minimal staff time and zero incremental equipment costs

Step 2:

Collect and track the daily, cumulative winter severity data that is publicly available, and enter it in an Excel spreadsheet formula that will automatically generate line charts showing ongoing changes in winter severity on a daily basis. Tweak staffing levels based on these trends and monitor outcomes in terms of the match between staff levels and patient demands, noting staff surpluses and shortages as they occur. Review and revise as needed.

Winter start date had was one of the most predictive winter severity metrics, and it is available prospectively. The date is announced when it occurs. Twin Towns need only consider the date relative to historic mean, median, and outliers, as well as rolling averages, and use this information to make staffing decisions. Review and revise as needed.

Twin Towns has ready access to qualitative data to supplement and leverage quantitative findings from this study: Staff and patients can shed light on the weather/alcoholism dynamic

Step 3:

Use brainstorming and anecdotal data from staff observations to develop simple questions or survey response items – directly relating to winter weather effects – that can be easily incorporated into intake and treatment protocols. Simple, affordable analysis of the data, with close attention to periods of mild winter weather and heavy patient intake, can point to actionable patterns. Survey patients about the dynamics of alcoholism onset, tying survey questions to winter weather patterns.

Questions?