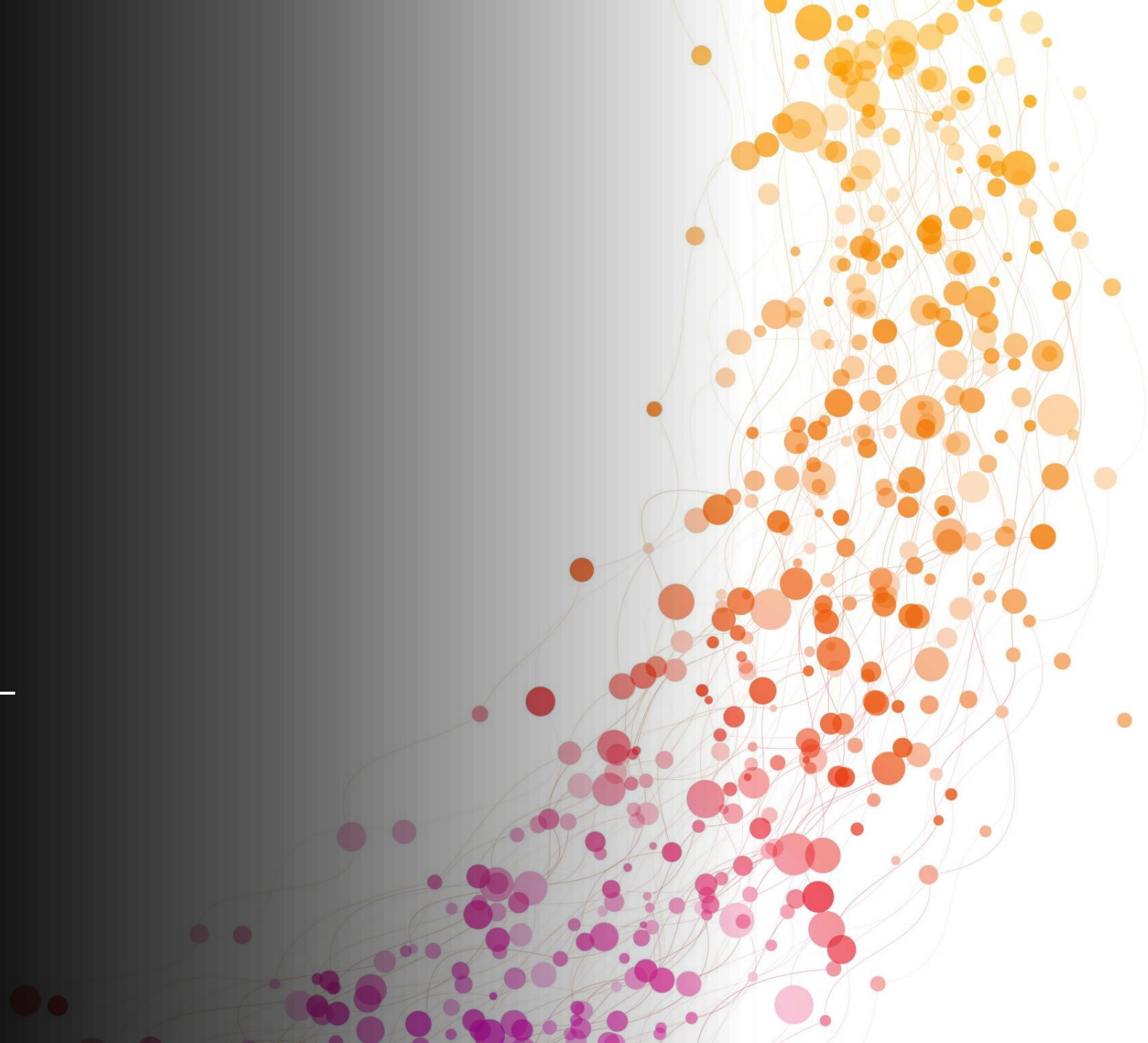
Project 1: Viral Hepatitis in Singapore

Gautam Raman



Agenda

- Setting the context
- Defining the problem
- Analysis
- Addressing the problem
- Future scope

Viral Hepatitis: What is it?

- Definition: Viral Hepatitis is caused by viruses which specifically target the **liver tissue**.
- There are several different viruses that cause hepatitis, including **Hepatitis A, B, C, D, and E.**

Hepatitis	Cause	Transmission Route
A	Hepatovirus	Food and water borne
B	Orthohepadnavirus	Blood and body fluids, parenteral, perinatal, sexual
C	Hepacivirus	Blood and body fluids, parenteral, perinatal (uncommon), sexual (not well defined)
D	Deltavirus	Co-infection with HBV or super-infection in a chronic HBV carrier.
E	Hepevirus	Mainly water-borne

Source: *National Centre for Infectious Diseases Singapore*

Viral Hepatitis in Singapore

Sub-optimal understanding of liver diseases, risk factors, and potential complications (Tan et al., 2021).

Some hepatitis strains affect as many as **1 in 25 Singaporeans**. Hepatitis is **endemic** in Singapore (Gan, 2022).

GSK is building a new **S$343 million** manufacturing facility in Singapore for Hepatitis B vaccines (CNA, 2023).

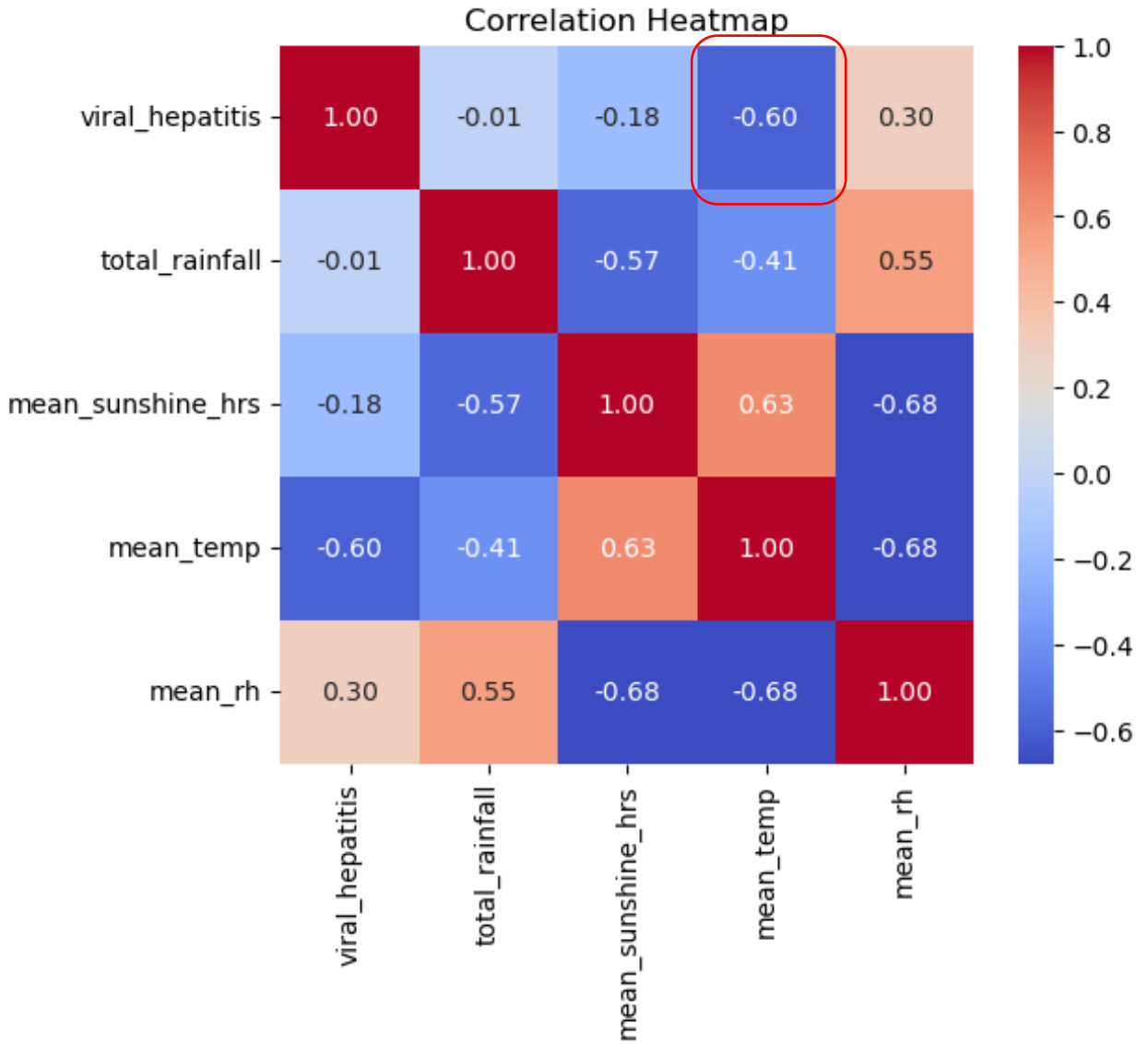
Problem Statement

"Is there a relationship between recorded cases of Viral Hepatitis and any weather indicators in Singapore? How can this be leveraged to create better targeted campaigns?"

Exploring the relationship of Hepatitis and the Weather

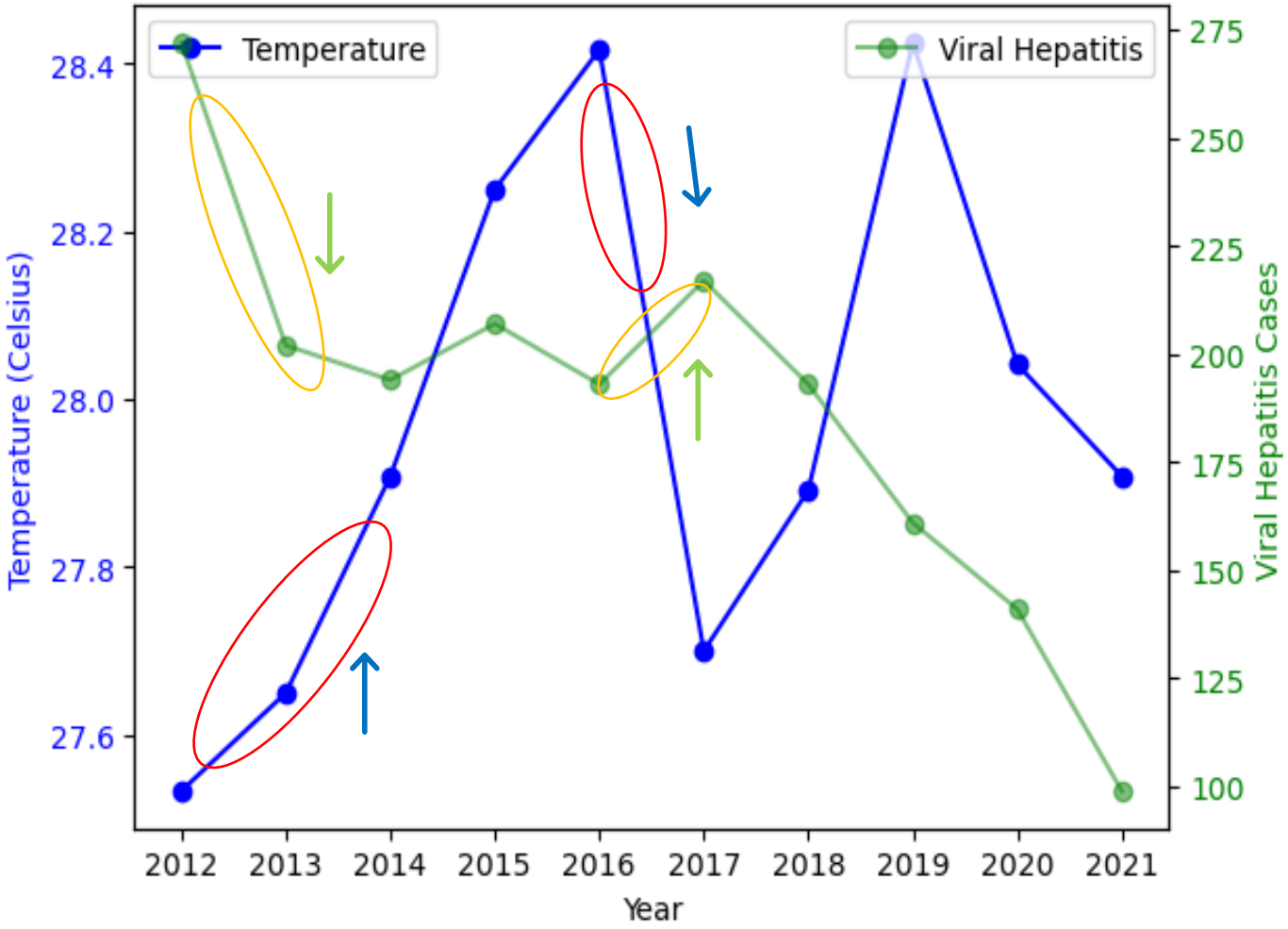
- A **correlation heatmap** was created to determine if there was a relationship between any weather indicators and Viral Hepatitis.

- It was found that, from **1982 to 2021**, the annual mean surface air temperature and number of Viral Hepatitis cases recorded were **moderately (negatively) correlated.**



The Relationship Visualised

- It is observed that, in the **past ten years**, generally, as the **temperature increases**, recorded cases of **Viral Hepatitis decrease** and vice versa.



Why, though?

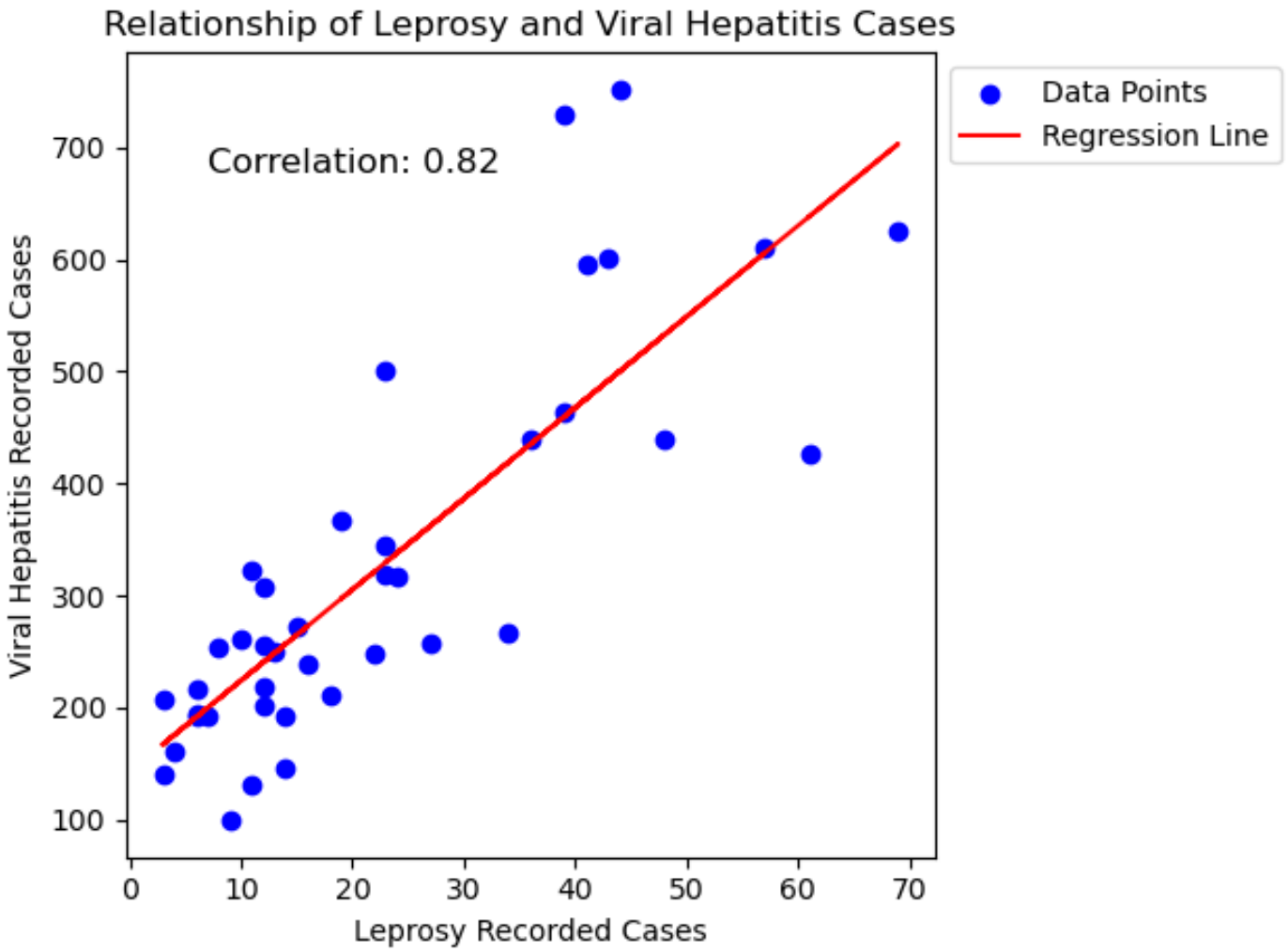
Studies conducted suggest that **survivability** of hepatitis virus **decreases** with temperature (Mbithi et al., 1991).

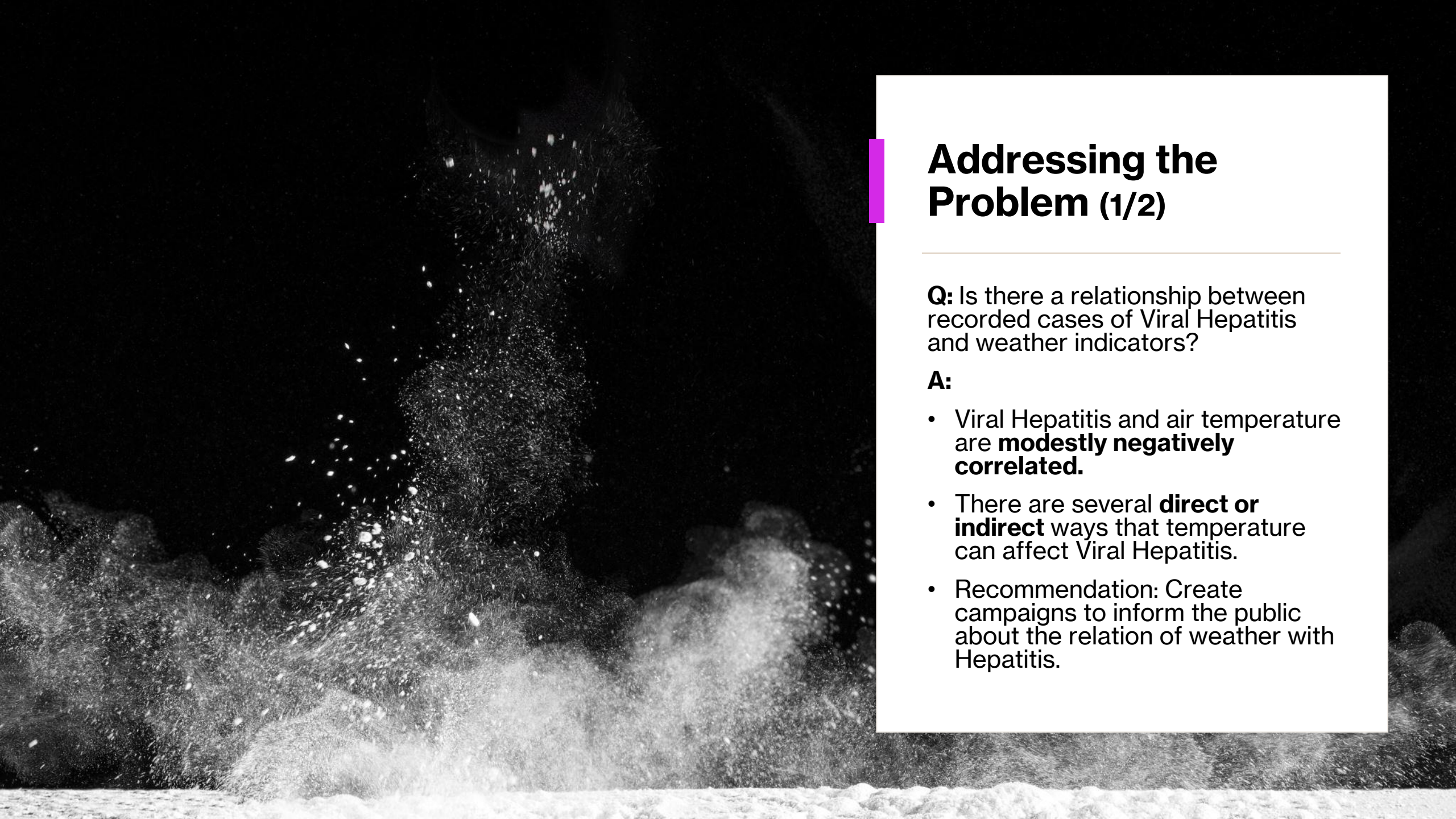
It is also likely that a change in temperature drives **hygiene habits** in people.

Immune cells are **more sluggish** colder weather, leaving people more exposed to infection (Thebarge, 2021).

Side Note: Viral Hepatitis and Leprosy

- It was found that Leprosy and Viral Hepatitis have a **strong positive correlation (0.82)**!
- Indicative that Leprosy can cause **co-infection** with Hepatitis (especially Hepatitis B) (Beate et al., 2021).
- Key takeaway: Campaigns targeted at **Leprosy** should also **spread awareness** about **Hepatitis.**





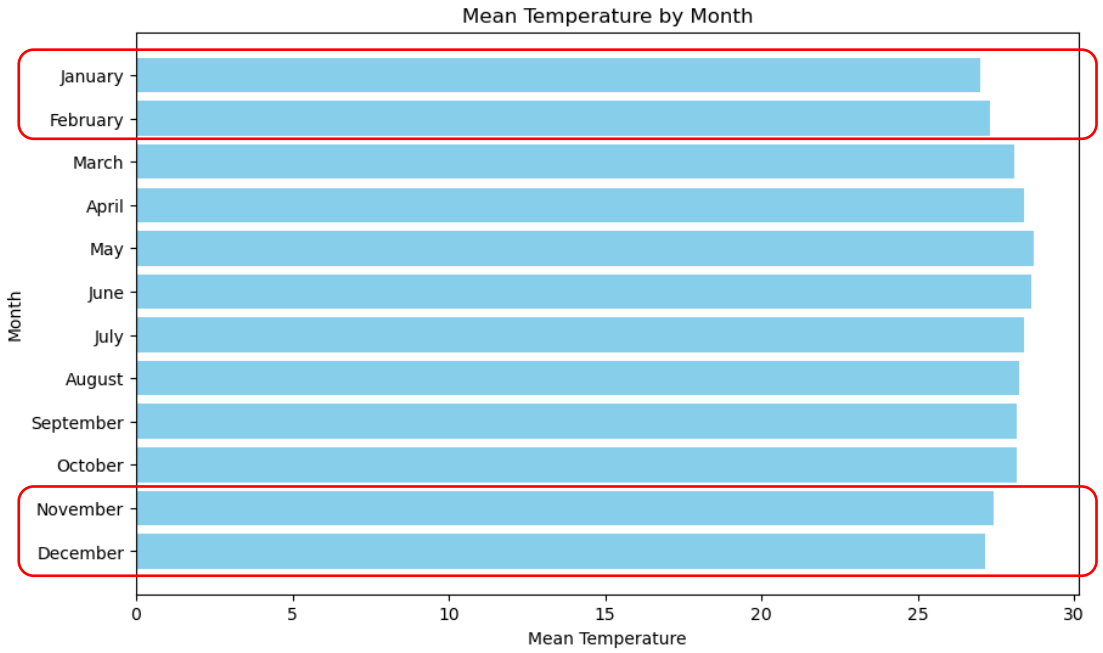
Addressing the Problem (1/2)

Q: Is there a relationship between recorded cases of Viral Hepatitis and weather indicators?

A:

- Viral Hepatitis and air temperature are **modestly negatively correlated.**
- There are several **direct or indirect** ways that temperature can affect Viral Hepatitis.
- Recommendation: Create campaigns to inform the public about the relation of weather with Hepatitis.

Addressing the Problem (2/2)



Q: How can this be leveraged to create better targeted campaigns?

A:

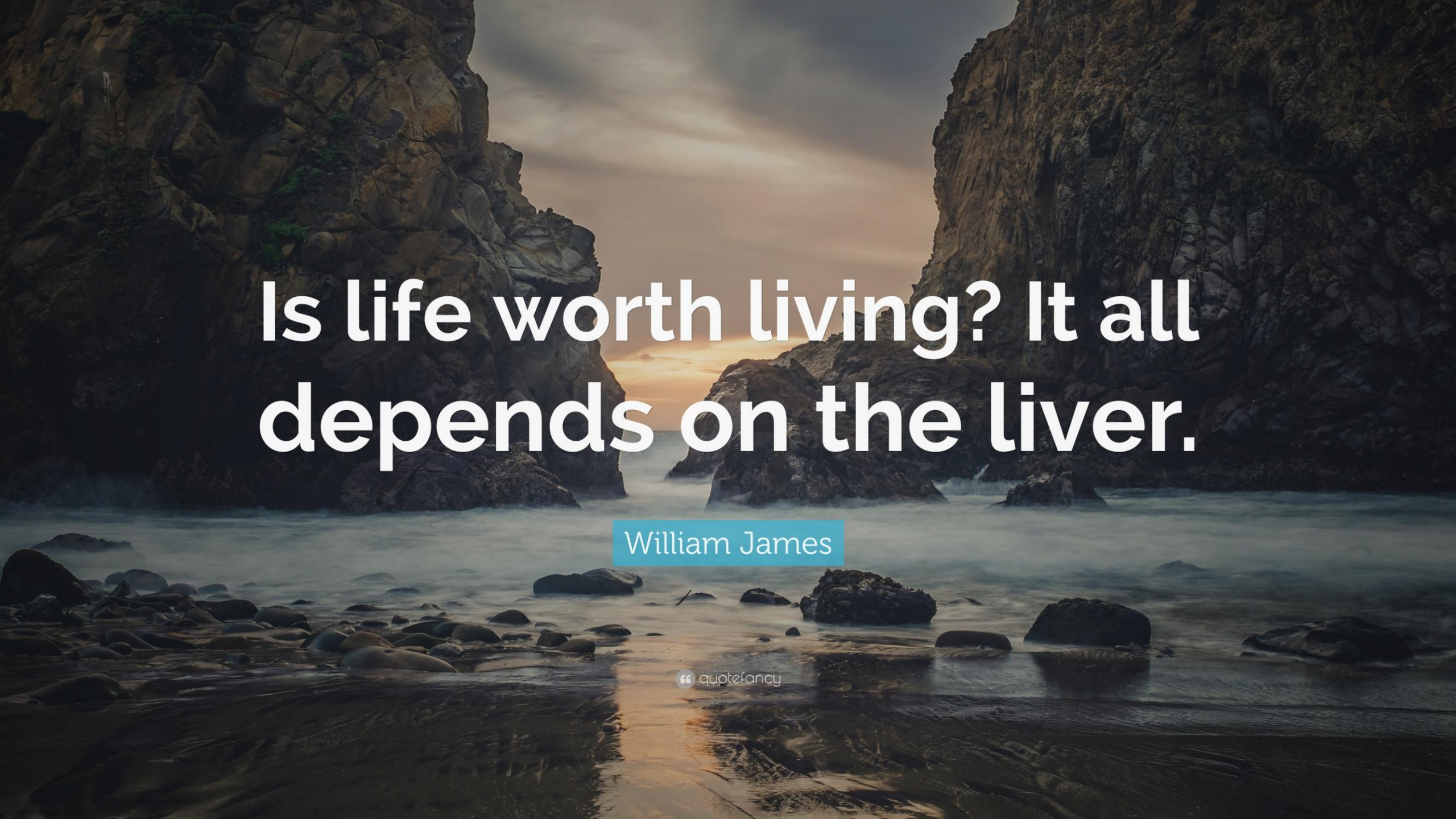
- **January, February, November, and December** are the colder months in Singapore since 2012.
- Recommendation: Create **two buckets** to separate various campaigns; **Year-Round** and **Targeted.**
- Year-Round Campaigns: Can be run **throughout the year**. Examples include vaccination drives, sex education in schools, needle exchange programs, and blood screening.
- Targeted Campaigns: These should be pushed specifically **during colder months** to help mitigate Hepatitis infections. Examples include promoting good hygiene, advocating safe sex between adults and other awareness campaigns.
- Moreover, Hepatitis could be **integrated** into campaigns about **other diseases** (like Leprosy).

Future Scope

The data could be further analysed by Hepatitis type, giving a more detailed look of the relation of each type to the weather.

Instead of looking at yearly data, an analysis on the monthly level could be done to give an in-depth look at infection trends.

The relation of hygiene behaviours with the weather could be studied further to give insight into what behaviours are triggered in different conditions.


Is life worth living? It all depends on the liver.
William James
quotefancy

Q&A

References

- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7904891/
- https://journals.asm.org/doi/abs/10.1128/aem.57.5.1394-1399.1991
- https://www.channelnewsasia.com/watch/pharma-giant-gsk-build-singapore-facility-making-hepatitis-b-vaccine-video-3627206
- https://onlinelibrary.wiley.com/doi/full/10.1111/jgh.15496
- https://www.ncid.sg/Health-Professionals/Diseases-and-Conditions/Pages/Hepatitis.aspx
- https://www.todayonline.com/singapore/how-much-do-you-know-about-hepatitis-b-and-what-if-youre-silent-carrier-virus-1951356
- https://www.gohealthuc.com/library/surprising-things-do-and-dont-affect-your-immune-system