

Seasonal and Temperature Effect on Serum Lithium Levels



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Introduction

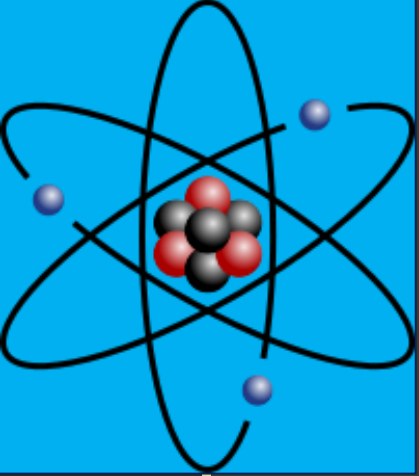
- Lithium remains gold standard treatment for bipolar for over 60 years.
- Narrow therapeutic range (0.6-0.8 mmol/L) & risk of irreversible neurotoxicity with higher conc.
- Key predisposing factor to chronic lithium toxicity is dehydration.
- Studies from Northern Hemisphere have linked high temperature with elevated lithium concentrations.



Objectives

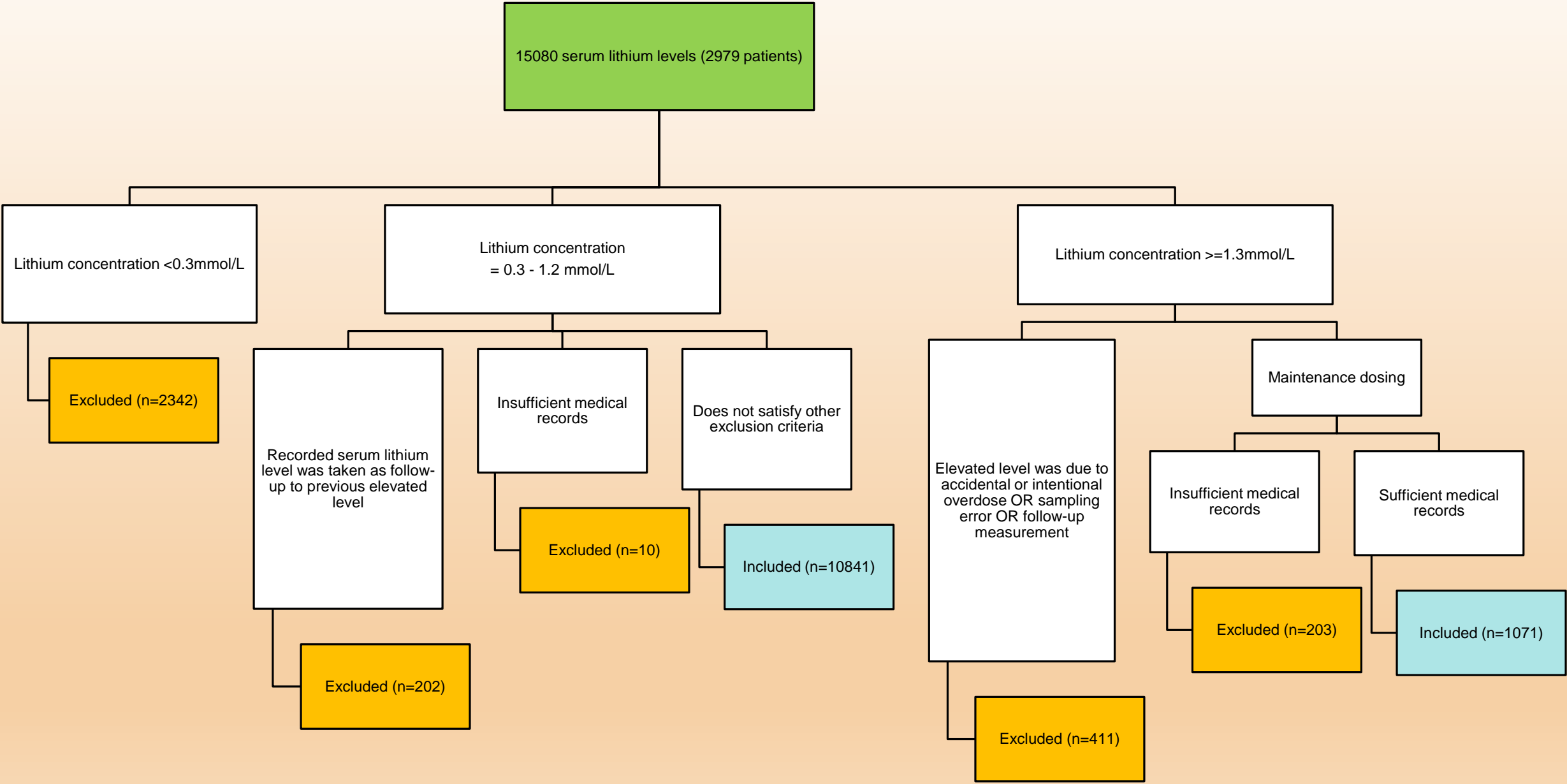


- Investigate the seasonal & temperature effect on serum lithium concentration in Sydney Australia.



Methods

- Retrospective review of all patients who had a serum lithium level taken from Prince of Wales and Sutherland Hospitals (2008-2018).
- Determine the effect of temperature & seasons on serum lithium concentrations.
- Longitudinal analysis on the effect of temperature and seasons within patients who had >15 levels.
- Statistical methods: SPSS, Pearson Correlation analysis.



Results

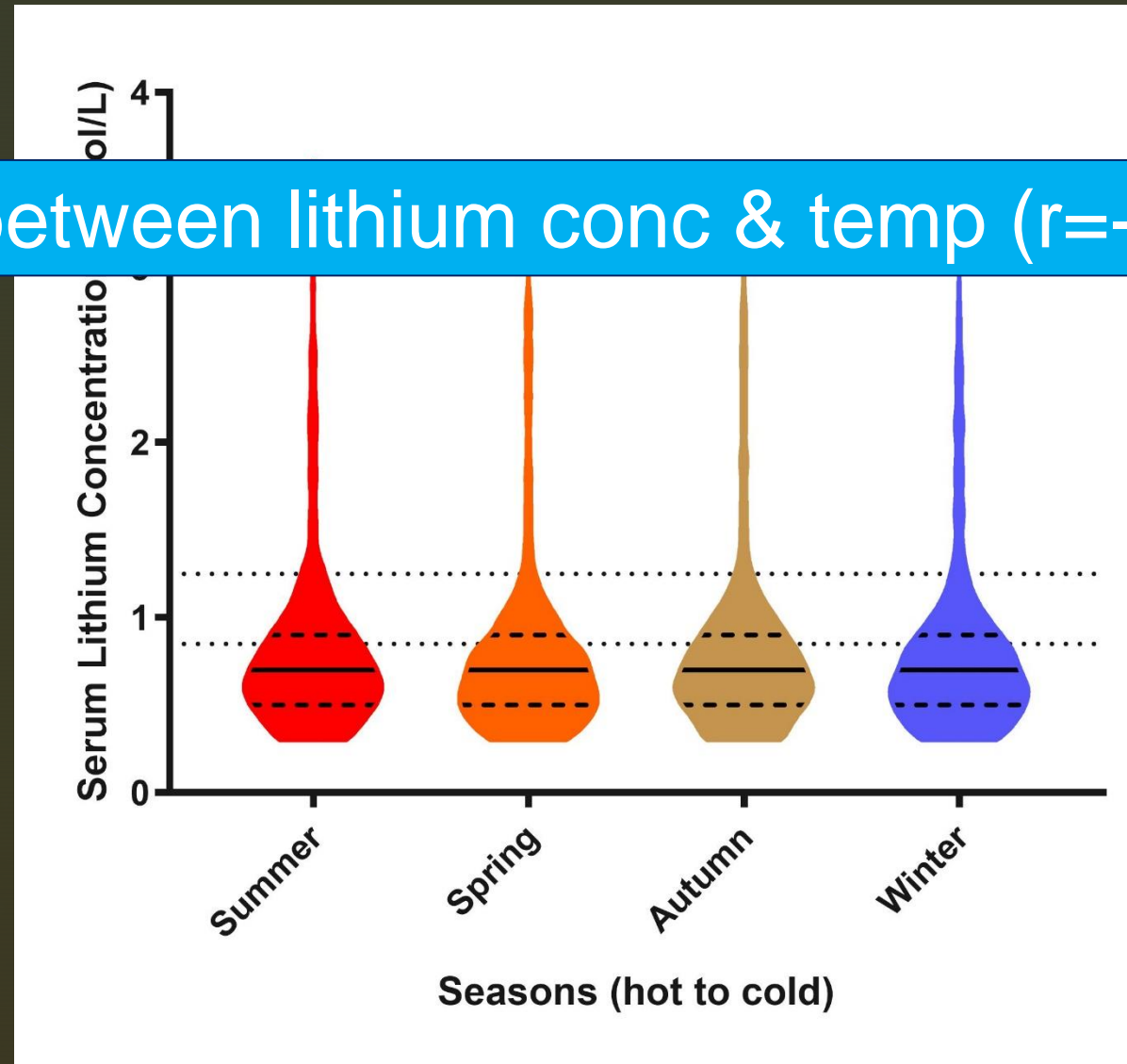
- 11,912 serum lithium concentrations taken from 2493 patients.
- 1071 patients had lithium conc > 1.3 mmol/L.
- Median age: 45 years (range: 11-97), with 51.9% females
- Median lithium conc 0.7 mmol/L (IQR: 0.5-0.9).

Distribution of serum lithium concentrations
(n=11912) & maximal daily temperatures
from 2008-2018.

| Season | N | Percentage (%) | Mean Maximum Daily Temperature (°C) ± SD |
|--------|------|----------------|--|
| Summer | 3038 | 25.50 | 27.39 ± 0.881 |
| Autumn | 3199 | 26.86 | 21.84 ± 0.887 |
| Winter | 2896 | 24.31 | 19.28 ± 0.920 |
| Spring | 2779 | 23.33 | 25.06 ± 0.985 |

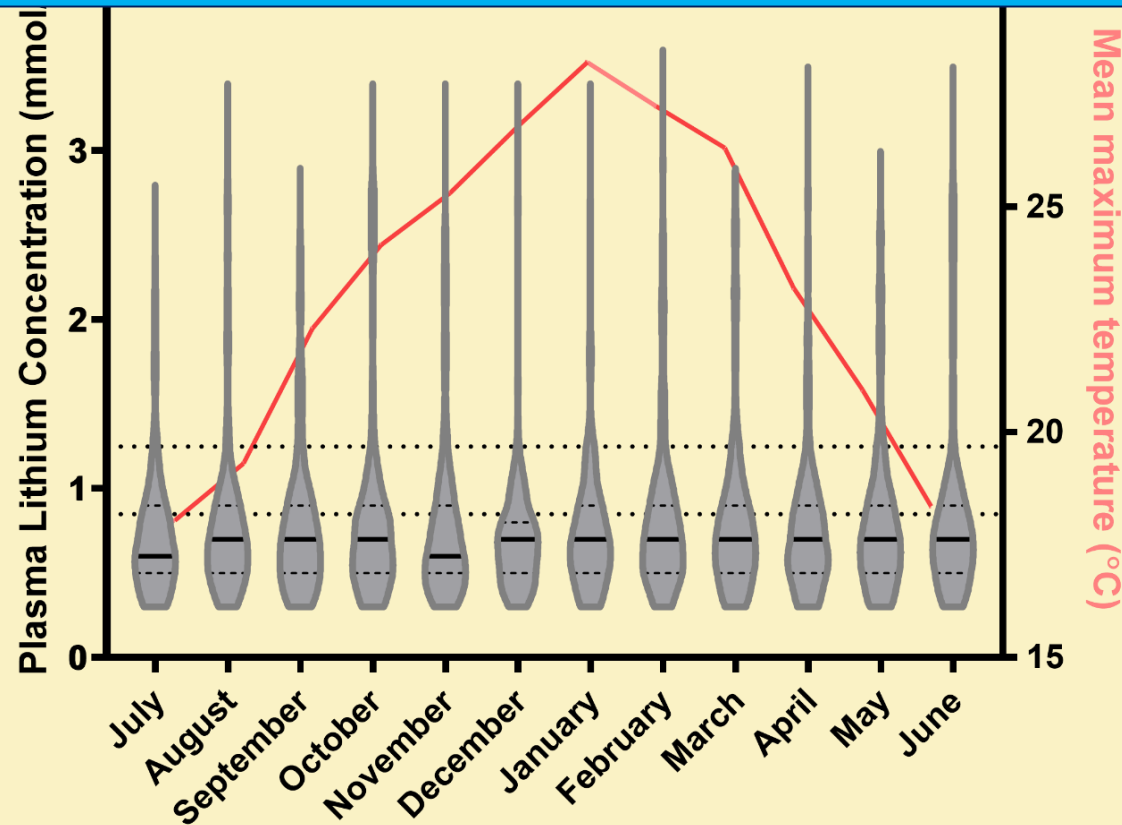
11912 serum lithium measurements across seasons.

No correlation between lithium conc & temp ($r=-0.008$, $p=0.4$).

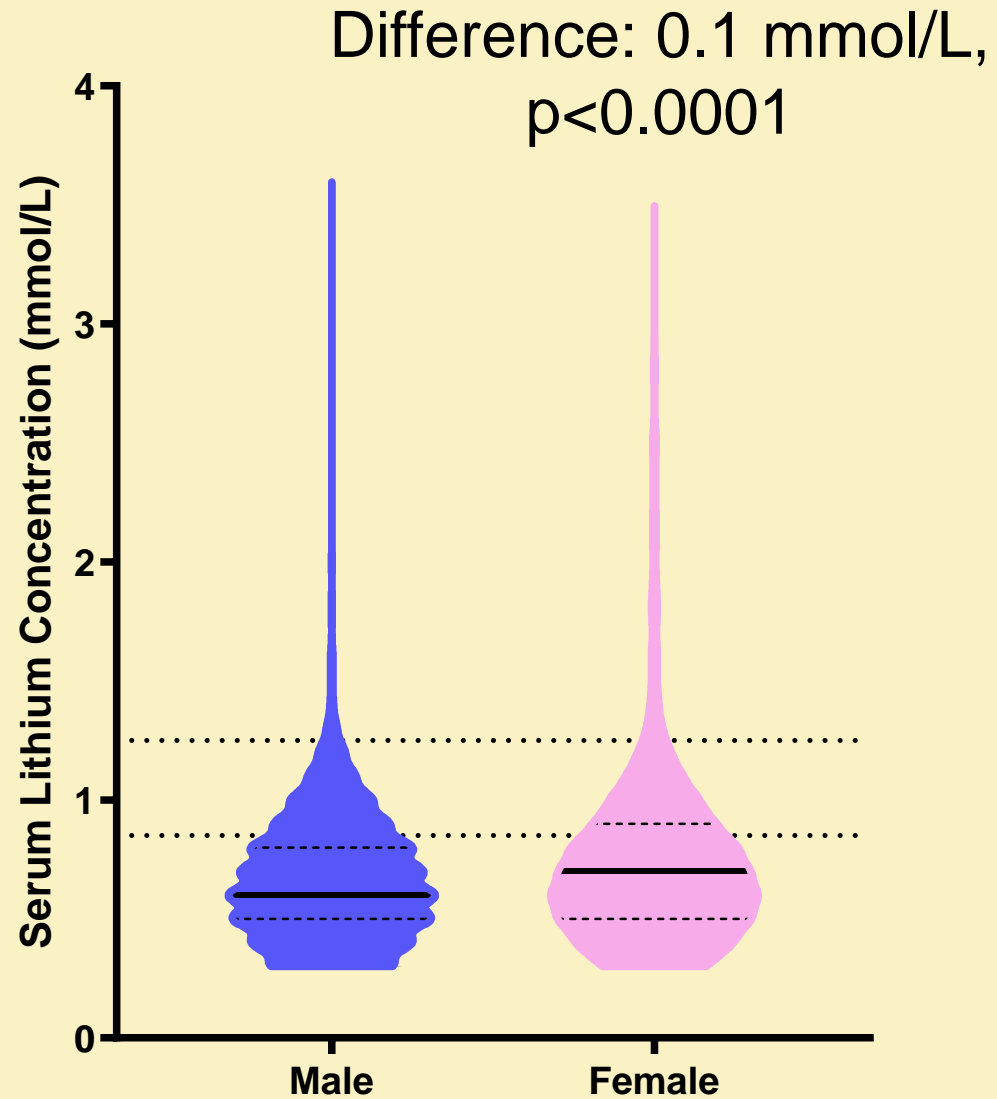


➤ *MONTHLY MEAN TEMPERATURE & SERUM LITHIUM MEASUREMENTS ACROSS DIFFERENT MONTHS.*

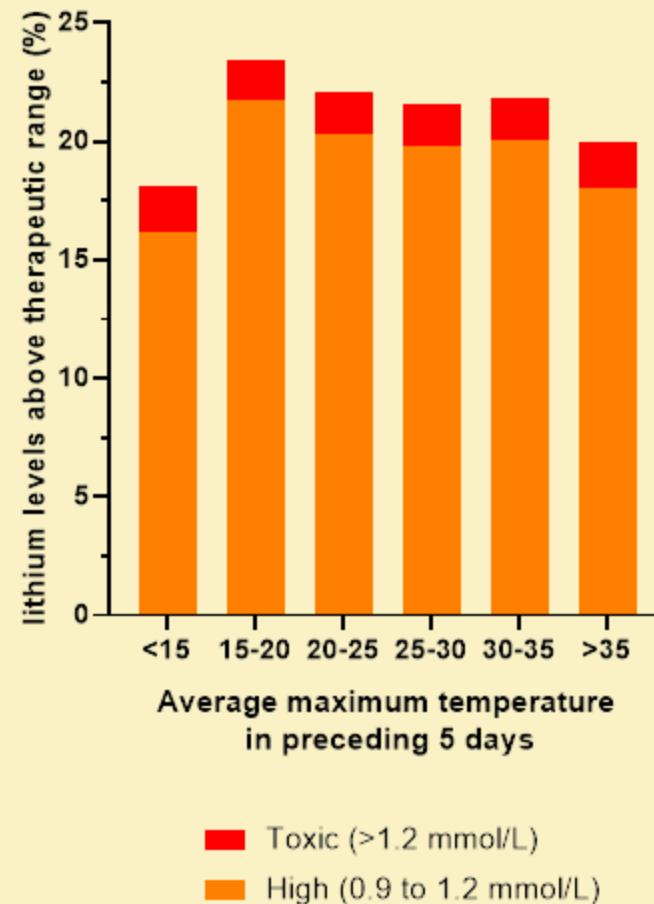
Mean lithium conc higher in June (0.82 mmol/L) than in Dec (0.7 mmol/L).



Gender - Serum lithium concentration

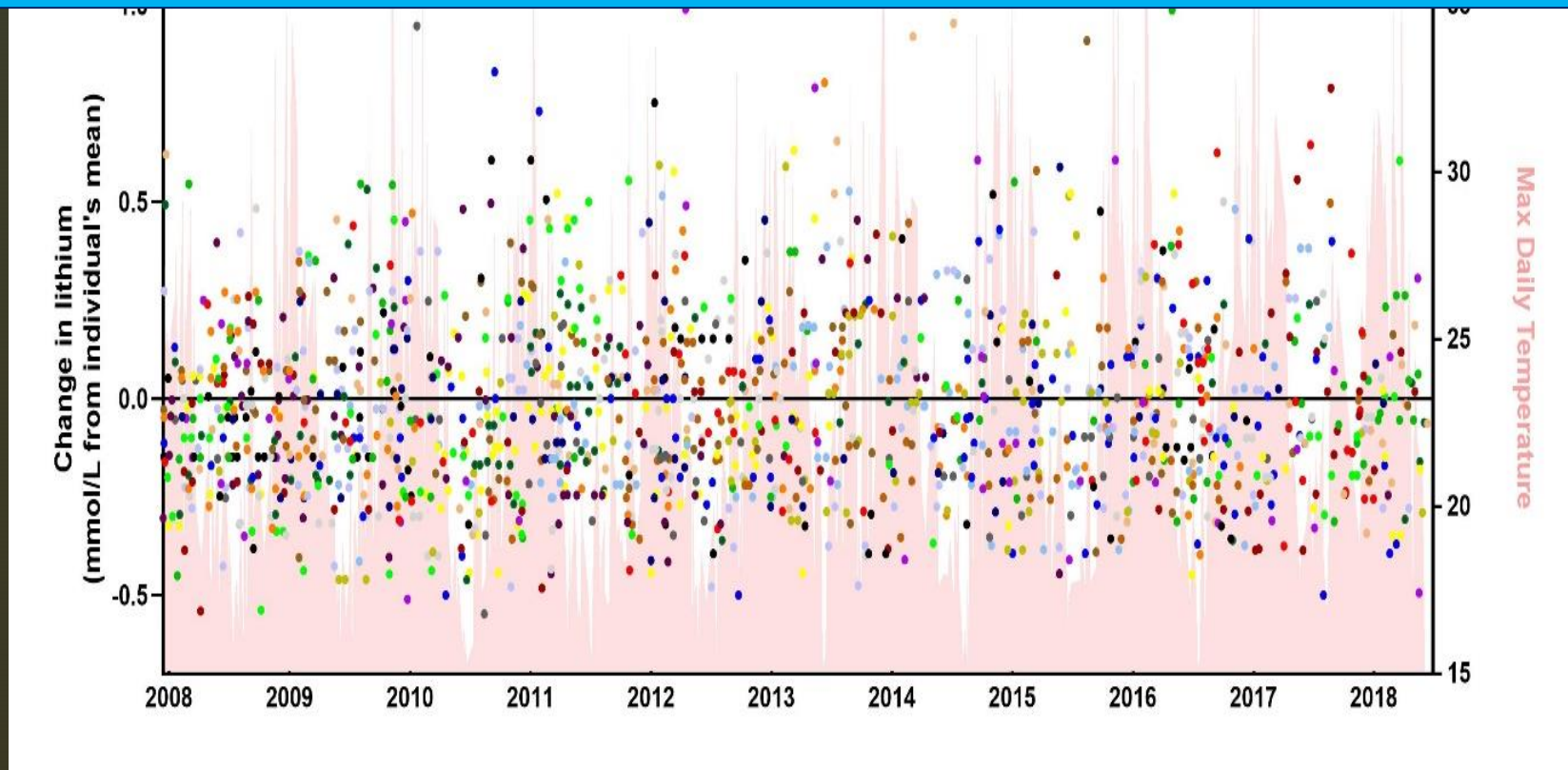


DISTRIBUTION OF TEMPERATURE FOR TOXIC AND HIGH NON-TOXIC SERUM LITHIUM CONCENTRATIONS.



A LONGITUDINAL PLOT OF LITHIUM CONCENTRATION VERSUS TIME.

No lithium conc variation across all patients over time
($n=123$, $r=0.008$).



Discussion

- No difference in serum lithium conc in all possible combinations of seasonal values (horizontal & longitudinal).
- May be explained by a lower variability of temperature difference.
- Strategies may be used to prevent dehydration in summer.
- Beware of the gender disparity in lithium conc.

Limitation

- Retrospective study, some with insufficient medical records. (1.7% excluded)
- Change in recommended lithium conc from 0.6-1 mmol/L to 0.5-0.8 mmol/L from 25/1/17.

Conclusion

- No clinically significant difference in serum lithium conc across seasons, months or temperature in both horizontal and longitudinal studies of patients.
- Patients may be able to adequately maintain hydration during hot weather.