Dissolved Lithium Concentrations and Texas Suicide Mortality Rates 1980-1998

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Introduction


- Disease ecology conceptual framework.
Suicide Statistics

- In US, 32,000 suicide deaths annually.

- 11th leading causes of death in US.

- Texans ranked 37th in completed suicides in 2002 in US.
Risk Predictors of Suicide Mortality

- Gender
  - Females 3x more likely than males to attempt suicide.
  - Males complete suicide 4x more than females.
Risk Predictors of Suicide Mortality

- Race
  - White males have highest suicide mortality rate.
  - Minority females have the lowest.
Risk Predictors of Suicide Mortality

- Lithium
  - Used in treating manic depressive illness
  - Suicide, homicide, and forcible rape
  - Continued lithium treatment is associated with reduced suicide risk
  - Dissolved lithium concentrations in groundwater may provide a protective function on suicide behavior and mortality.
Lithium Concentrations in Nature

- Associated with volcanism, may explain presence in many aquifers

- Many counties and cities in Texas rely on groundwater for their water needs.

- Nutritional uptake of lithium through common foods and vegetables.
Hypotheses

- Gender is a predictor of suicide mortality.
- Race is a predictor of suicide mortality.
- County suicide mortality rates will be influenced by dissolved lithium concentrations in the groundwater.
- Suicide mortality rates are changing through time.
Data Sources


- Dissolved lithium concentration data from Texas Water Development Board Groundwater Database
Methodology

- Spearman’s 2-tailed Rank Correlation
- Wilcoxon Two Sample Test
Suicide Mortality Rates 1980-1998
by Texas County
*Adjusted to 2000 Standard
Males have a higher suicide rate than females ($Z=-13.706$, $p=.000$).

Males Average = 22.5 per 100,000

Females Average = 5.4 per 100,000
Male Suicide Mortality Rates 1980-1998
by Texas County
*Adjusted to 2000 Standard

Figure II

Legend
Death Rate per 100,000
- 0.000 - 17.700
- 17.701 - 21.400
- 21.401 - 24.100
- 24.101 - 27.800
- 27.801 - 52.200

Miles
RACE AND SUICIDE

- Counties with higher % whites had higher suicide mortality \((r=.315, p=.000)\).

- Counties with higher % Hispanics have lower suicide mortality \((r=-.250, p=.000)\).

- No correlation between % African Americans and suicide mortality rates \((r=-.014, p=.827)\).
Dissolved lithium concentrations in groundwater is inversely related to suicide mortality rates ($r = -0.150, p = 0.017$).
TEMPORAL VARIATIONS OF SUICIDE

Suicide mortality rates (1980-1989) are lower than 1990-1998
(Z = -2.351, p=.019).
Difference in Mean Suicide Mortality Rates
1980-1989 compared to 1990-1998
by Texas County
*Adjusted to 2000 Standard

Legend
Change in Death Rate per 100,000
-31.2 - -11.8
-11.7 - -3.9
-3.8 - 0.8
0.9 - 7.0
7.1 - 22.6
CONCLUSIONS

- Male suicide rates are significantly higher than female suicide mortality rates.
- % Whites is positively correlated to suicide mortality rates.
- % Hispanics account for a negative correlation to suicide mortality rates.
- Counties with lower rates of dissolved lithium concentrations in groundwater have higher suicide rates.
- Suicide mortality rates are increasing with time.
SUGGESTIONS FOR FURTHER RESEARCH

- Intra-county variations ignored
- Other water sources (e.g. surface and tap water) must be addressed.
- Finer geographical scale required.
- How the underlying geology affects lithium concentrations.
References


References (cont.)


