Figure S1. Search strategy used for EMBASE in Ovid

1. Lithium.mp or exp Lithium/

2. drinking water.mp or exp Drinking Water/

3. public water.mp

4. exp Water/ or water.mp

5. tap water.mp

6. 2 or 3 or 4 or 5

7. suicide.mp or exp Suicide/

8. mortality.mp or exp Mortality/

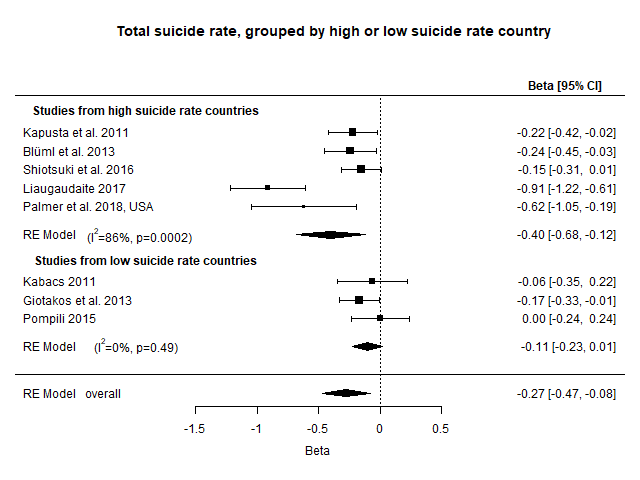
9. violent.mp

10. violence.mp or exp Violence

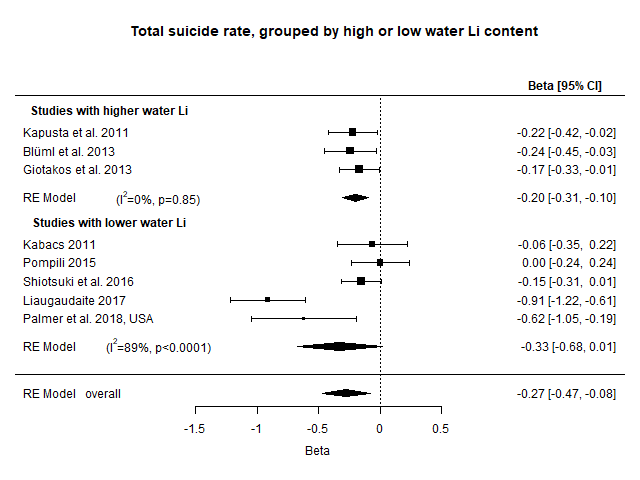
11. 7 or 8 or 9 or 10

12. 1 and 6 and 11

**Figure S2**

****

**Figure S3**

****

**Table S1. Quality assessments of included studies**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Evaluation criteria** | Sugawara et al (2013)(1) | Shiotsuki et al. (2016)(2) | Kabacs et al (2011)(3) | Kapusta et al. (2011)(4) | Giotakos et al (2013)(5) | Pompili et al (2015)(6) | Liaugaudaite et al 2017(7) | Bluml et al (2013)(8) | Palmer et al. 2018(9) |
| Are the subjects in the study representative of conclusions being drawn? | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Were the statistical methods used appropriately? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Were confounders adjusted for appropriately? | ✓ | ✓ | ✗ | ✓ | ✗ | ✓ | ✗ | ✓ | ✗ |
| Do the authors present and justify key elements of the study design? | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ |
| Discussion of limitations (e.g. ecological fallacy) | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ | ✓ | ✓ | ✗ |

**Table S2. Studies included in the narrative review**

| **Study** | **Region and number of locations** | **Population data** | **Number of lithium samples, dates and methods of collection and analysis** | **Lithium levels in µg/l**  **Mean (range)** | **Mean suicide rate (per 100,000/y)** | **SMR**  **mean (range)** | **Covariates** | **Results** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Schrauzer and  Shrestha 1990(10) | USA, Texas, 27 counties | All suicides from 1978 – 1987 in counties with high (70-160µg/l), medium (13-60 µg/l) and low (1-12 µg/l) water lithium | 2-5 samples per county, local tap water collected in 1968 as part of Texas Nutrition Survey, analysed using spectrophotometry | NR (0 – 160) | High Li counties 8.7 (sd 0.85)  Medium Li counties 14.8 (sd 2.9)  Low Li counties 14.2 (sd 1.3) or 13.9 (sd 1.2) on excluding counties with high population density | NR | Adjusted for population density by repeating analysis excluding counties with high population density | T test comparing suicide rate of high and low lithium counties found higher rate in low lithium counties, p < 0.005 |
| Ohgami et al. 2009(11) | Japan, Oita prefecture, 18 municipalities | All suicides from 2002 – 2006, total population 1,206,174 | NR, samples, analysed using ion chromatography or mass spectrometry | NR (0.7 – 59) | NR | T:105 (60 – 181) | None | In population weighted least squares regression of SMR on Log Li (µg/l)  T: β = -0.65, p < 0.004  M: β = -0.61, p < 0.008  F: β = -0.46, 0.05 < p < 0.06 |
| Helbich et al. (2012)(12) | Austria, 99 districts | All suicides 2005-2009 (total population 8,297,964) | 6460; 2005-2010; samples of local drinking water, analysed by inductively coupled plasma optical emission spectrometry | 11·3 (sd 27) | T: 16·5†  M: 26·4†  F: 7·00† | T: 0.790†,‡  M: 0.821†,‡  F: 0.673†,‡ | Proportion of Roman Catholics, density of psychiatrists | Spearman correlation:  **T: -0·26, p = 0·009**  Global spatial regression of SMR (with ref 1·00) on Li (mg/l)  **T: β = -4·844, p < 0·001** |
| Helbich et al. 2013(13) | Austria, 99 districts | All suicides 2005-2009 (total population 8,297,964) | 6460; 2005-2010; samples of local drinking water, analysed by inductively coupled plasma optical emission spectrometry | 10 (sd 11) | T: 16·5†  M: 26·4†  F: 7·00† | T: 0.802‡ (sd 0·198) | Covariate: altitude  Controls considered: population density, income per capita, Roman Catholics, psychiatrist density, GP density, psychotherapist density, unemployment rates | Linear regression model of SMR‡ on Li (mg/l)  **T: β (se) =--9**·**407 (2.218), p < 0·001** |
| Helbich et al. 2015(14) | Austria | All suicides in the period 2005-2009 (total population 8,297,964) | 6460 samples; 2005-2010; local drinking water, analysed by inductively coupled plasma optical emission spectrometry | 10 (SD 10) | T:16·5†, M:26·4†,  F: 7·00† | NR | Proportion of Roman Catholics, population density, Li prescriptions, income, density of psychiatrists, GPs, psychotherapists, unemployment rates | Multivariate spatial Bayesian hierarchical models (without prescription interaction) of SMR (with ref 1·00) ion log Li  **T: β (95%CI) = -0·080 (-0.136 to -0.124)**  **M: β (95%CI) = -0·092 (-0.157 to -0.026)**  F: β (95%CI) = -0.044 (-0.148 to 0.059) |
| Ishii et al. 2015(15) | Japan, Kyushu Island, 274 municipalities | All registered suicides in 2011.  Total population: 14,646,121 | 434 samples, 2010-2013; collected from rail station or municipal office; analysed by mass spectrometry | 4.2 (0 – 130) | T: 23·8  M: 35·3  F:13·4 | T: 114 (0 - 729)  M: 120 (0 – 1082)  F: 101 (0 - 644) | Proportion of elderly people, 1 person households, yrs in college education, primary industry, unemployment rate, marriage rate, mean temperature, postal savings. | Population weighted least squares regression of SMRs on Log Li  Unadjusted analyses  T: β = -0.175, p = 0.031  M: β = -0.228, p = 0.005  F: β = 0.004, p = 0.957  Adjusted analyses  T: β = -0·122, p = 0·094  **M: β = -0**·**169, p = 0**·**019**  F: β = 0·031, p =0·706 |

**References**

1. Sugawara N, Yasui-Furukori N, Ishii N, Iwata N, Terao T. Lithium in Tap Water and Suicide Mortality in Japan. International Journal of Environmental Research and Public Health. 2013; 10(11): 6044-8.

2. Shiotsuki I, Terao T, Ishii N, Takeuchi S, Kuroda Y, Kohno K, et al. Trace lithium is inversely associated with male suicide after adjustment of climatic factors. Journal of Affective Disorders. 2016; 189: 282-6.

3. Kabacs N, Memon A, Obinwa T, Stochl J, Perez J. Lithium in drinking water and suicide rates across the East of England. The British Journal of Psychiatry. 2011; 198(5): 406-7.

4. Kapusta ND, Etzersdorfer E. Lithium concentrations in drinking water reply. British Journal of Psychiatry. 2011; 198(6): 494-.

5. Giotakos O, Nisianakis P, Tsouvelas G, Giakalou VV. Lithium in the Public Water Supply and Suicide Mortality in Greece. Biological trace element research. 2013; 156(1-3): 376-9.

6. Pompili M, Vichi M, Dinelli E, Pycha R, Valera P, Albanese S, et al. Relationships of local lithium concentrations in drinking water to regional suicide rates in Italy. The World Journal of Biological Psychiatry. 2015; 16(8): 567-74.

7. Liaugaudaite V, Mickuviene N, Raskauskiene N, Naginiene R, Sher L. Lithium levels in the public drinking water supply and risk of suicide: A pilot study. Journal of Trace Elements in Medicine and Biology. 2017; 43: 197-201.

8. Bluml V, Regier MD, Hlavin G, Rockett IR, Konig F, Vyssoki B, et al. Lithium in the public water supply and suicide mortality in Texas. Journal of Psychiatric Research. 2013; 47(3): 407-11.

9. Palmer A, Cates ME, Gorman G. The Association Between Lithium in Drinking Water and Incidence of Suicide Across 15 Alabama Counties. Crisis. 2018: 1-7.

10. Schrauzer GN, Shrestha KP. Lithium in drinking water and the incidences of crimes, suicides, and arrests related to drug addictions. Biological trace element research. 1990; 25(2): 105-13.

11. Ohgami H, Terao T, Shiotsuki I, Ishii N, Iwata N. Lithium levels in drinking water and risk of suicide. British Journal of Psychiatry. 2009; 194(5): 464-5.

12. Helbich M, Leitner M, Kapusta ND. Geospatial examination of lithium in drinking water and suicide mortality. International journal of health geographics. 2012; 11: 19.

13. Helbich M, Bluml V, Leitner M, Kapusta ND. Does altitude moderate the impact of lithium on suicide? A spatial analysis of Austria. Geospatial Health. 2013; 7(2): 209-18.

14. Helbich M, Leitner M, Kapusta ND. Lithium in drinking water and suicide mortality: interplay with lithium prescriptions. British Journal of Psychiatry. 2015; 207(1): 64-71.

15. Ishii N, Terao T, Araki Y, Kohno K, Mizokami Y, Shiotsuki I, et al. Low risk of male suicide and lithium in drinking water. The Journal of Clinical Psychiatry. 2015; 76(3): 319-26.