Acute ambient air pollution exposure and suicide risk in Utah

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Suicide

- 8th leading cause of death in Utah
- Suicide has a complex etiology

Genetic risk factors
- Psychiatric and/or physical illness

Environmental risk factors
- Previous and current social experiences
- Physical, chemical, and biological exposures
  - Rainfall & temperature
  - Duration of sunshine
  - Spring
  - Pollen
  - Altitude
Air pollution and suicide

- In Asia, risk of suicide related to short-term exposure to particulate matter
- Wasatch Front, Utah
  - Winter-time cold air and pollution inversions
  - Daily mortality, hospital admissions for respiratory disease, and emergency department visits for asthma

Is acute air pollution exposure associated with suicide?
Study design

• All completed suicides in Salt Lake County, Utah 2000-2010 ($N = 1546$)
  – Utah Department of Health’s Office of the Medical Examiner

• U.S. EPA AirData
  – Nitrogen dioxide ($\text{NO}_2$), fine particulate matter ($\text{PM}_{2.5}$), coarse particulate matter ($\text{PM}_{10}$), and sulfur dioxide ($\text{SO}_2$)

• Time-stratified case-crossover design
  – Conditional logistic regression models
    • Lag and cumulative lag days
    • Controlled for meteorological variables
    • Stratified by suicide characteristic
Preliminary findings
Suicide risk by season

NO$_2$

PM$_{2.5}$
Conclusions

• Suicide risk associated with air pollution
• Odds of suicide highest in spring (PM$_{2.5}$) and spring/fall (NO$_2$)
  – Interaction between air pollution and other spring/fall risk factors for suicide
• First U.S. based study
• Findings expand beyond vast meteorological, geographical and cultural differences
Air quality, health and society seed grant

• **Aim 1**: Estimate the association between exposure to ambient air pollutants and completed suicide controlling for meteorological, seasonal, social and individual factors.

• **Aim 2**: Determine if the observed association between ambient air pollution and suicide is modified by familial risk of suicide.

• **Aim 3**: Determine if the observed association between ambient air pollution and suicide is modified by familial risk of suicide/pulmonary disease.
Exposure Assessment

- Retrospective data
- Large data sets
- Limited data
Approach

Establish locations based on place..
  – residence
  – school (kids)
  – place of work
and time
  – dates of outcomes
Create exposure metrics based on etiology and previous research
  – specific pollutant(s)
  – lag time(s)
  – duration
Enhanced geo-coding

Diagram:
- Address
- Address points
  - AGRC current street data
  - Historical road datasets
- Pre-processing
- Post match assessment
  - Geocode
  - Metadata, Data quality
Exposure measures

- Traffic emissions
- Ambient criteria pollutants
- Inversions
- HAPS
Methods

- Proximity models
- Proximity + meteorology
- Land use regression
- Spatial interpolation (kriging)
- Dispersion modeling + meteorology
- Dispersion + meteorology + chemistry
Salt Lake Co. Address Points = 316,035
Land Use Regression

- Concentration is a function of:
  - Surrounding land use
  - Major sources, traffic
  - Meteorology

- Estimate relationship using regression
- Predict into locations and times
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