

# Maternal exposure to metal components of PM<sub>2.5</sub> and low birth weight in New Mexico, USA

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## Background

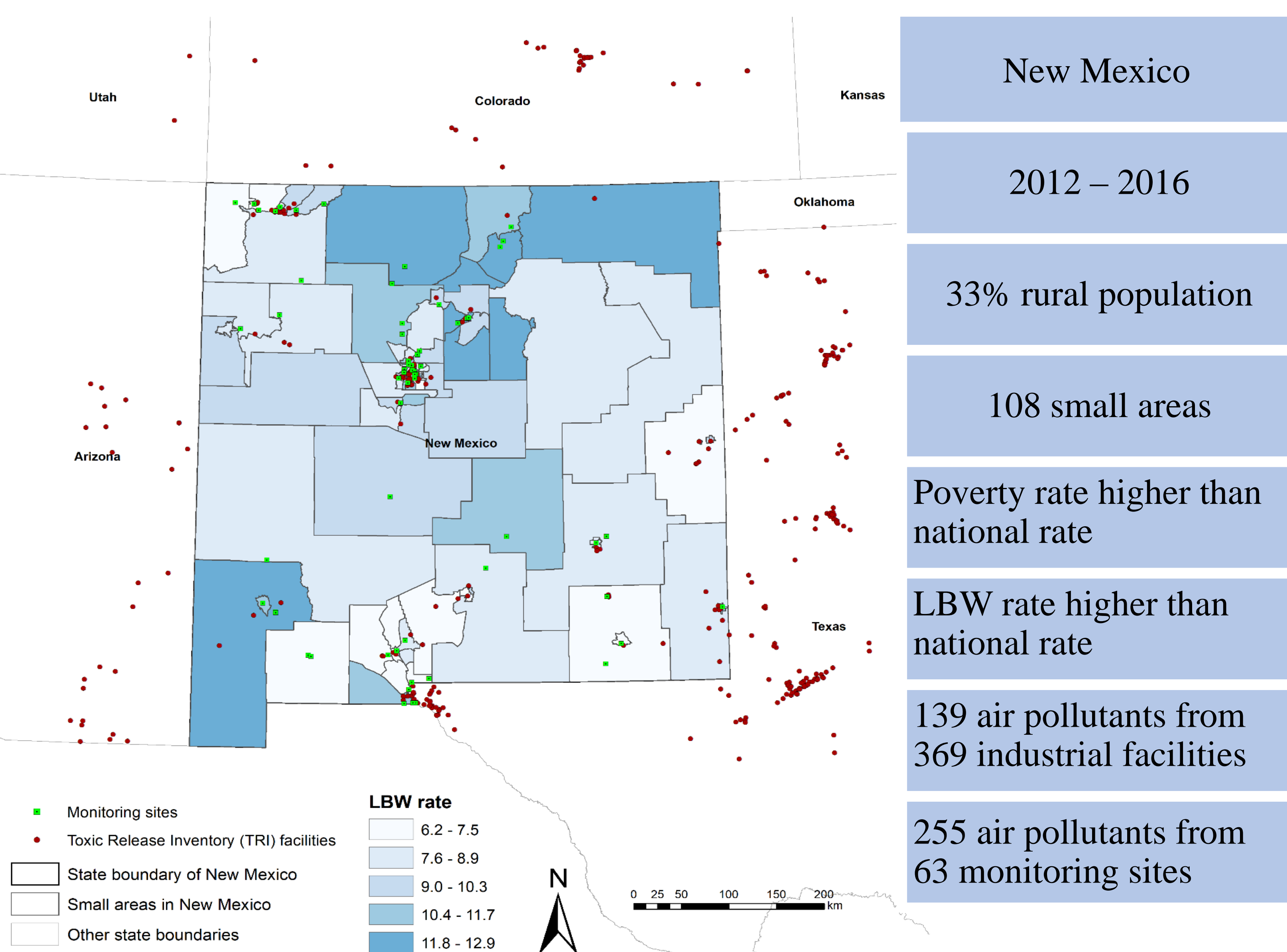
- Low birth weight (LBW) refers to an infant who is **under 2500 grams** (5.5 pounds) at birth.
- **Adverse health outcomes** of LBW: fetal and neonatal mortality and morbidity, stunted growth, cognitive impairment, hearing impairment, cardiovascular disease, obesity, and respiratory distress in children and adults.
- Major **risk factors** for LBW: genetics, maternal characteristics and behaviors, socioeconomic factors, and environmental risk factors (maternal exposure to air pollution....).
- Exposure to **metal components** of air pollution can adversely affect health outcomes.
- **Literature gap**: There has been no study in New Mexico of the impact of maternal exposure to metal components of PM<sub>2.5</sub> on the LBW of offspring.

## Research question

What is the association between maternal exposure to metal components of PM<sub>2.5</sub> and LBW in offspring in New Mexico, 2012-2016?



## Study area



## Data

### • Birth data (2012-2016)

- New Mexico's Indicator-Based Information System (NM-IBIS) on small area level.
- Variables: female percentage, race/ethnicity compositions in the population, population marriage status and educational level (U.S. Census Bureau).

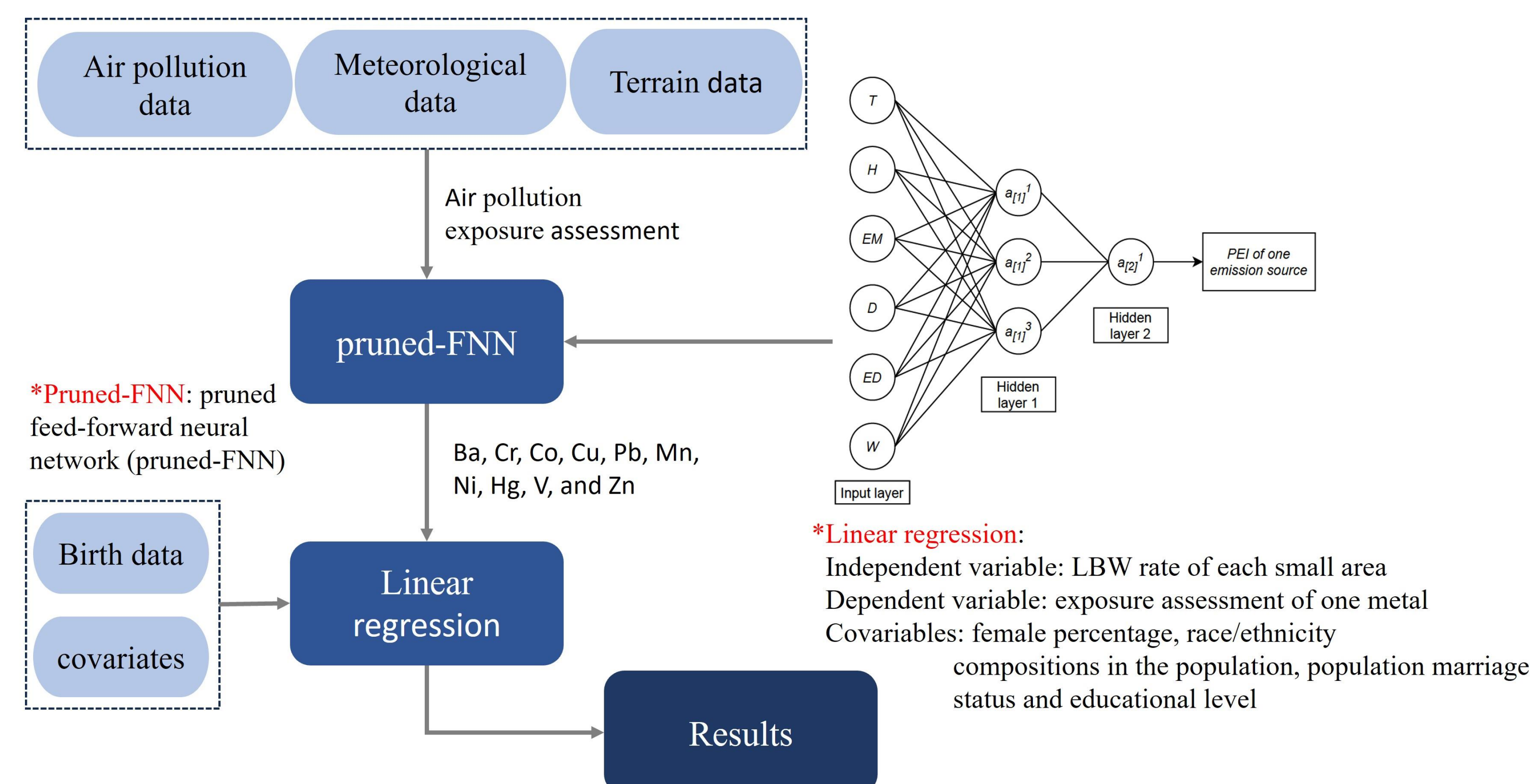
### • Air quality data (2012-2016)

- Industrial emission data (Toxics Release Inventory (TRI) Program, USEPA)
- Monitoring data (Air Quality System (AQS) DataMart, USEPA)

### • Other data (2012-2016)

- Terrain data
- Meteorological data (wind data, humidity data, and temperature data).

## Methodology

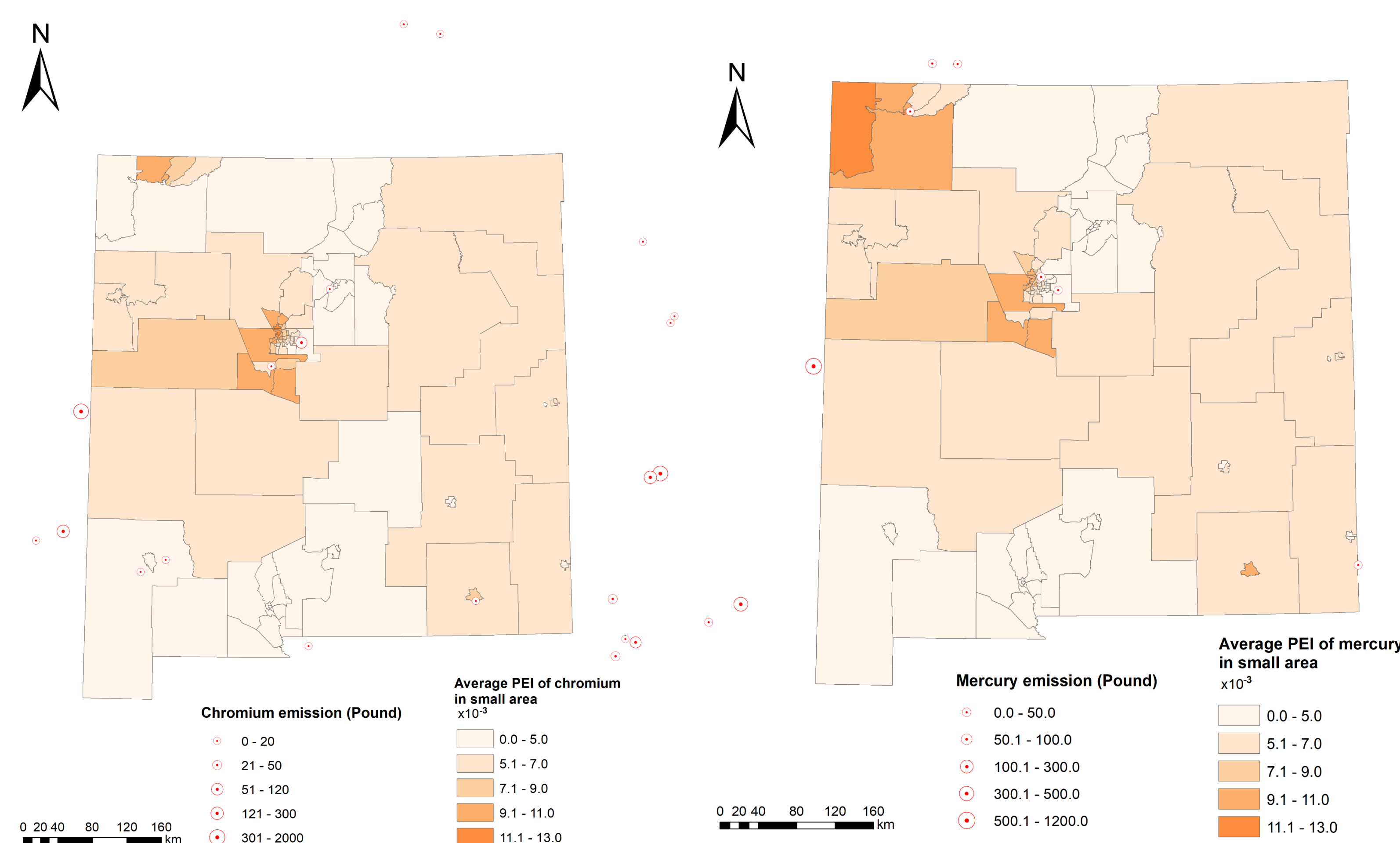


## Result

Metal components (PM <sub>2.5</sub> )	LBW rate% change per IQR increase in pollutant exposure	CI (95%)	p-value	IQR (x10 <sup>-3</sup> )
Mercury (Hg)	0.43%	0.18% - 0.68%	<0.001*	0.307
Nickel (Ni)	0.35%	0.08% - 0.62%	0.011	0.731
Chromium (Cr)	0.63%	0.15% - 1.12%	0.011*	1.729
Lead (Pb)	0.32%	0.05% - 0.60%	0.022	0.961
Copper (Cu)	0.50%	0.07% - 0.93%	0.025	1.390
Zinc (Zn)	0.36%	-0.06% - 0.78%	0.150	1.673
Cobalt (Co)	0.24%	-0.20% - 0.68%	0.374	0.035
Vanadium (V)	0.24%	-0.21% - 0.69%	0.388	0.238
Manganese (Mn)	0.12%	-0.20% - 0.44%	0.530	0.867
Barium (Ba)	0.12%	-0.25% - 0.49%	0.592	3.355

\*Statistically significant after false discovery rate correction (FDR: 0.05)  
IQR: interquartile range increase

## Discussion & Conclusion



- From 2012 to 2016, there were industrial facilities **in central and southwest of New Mexico and surrounding area** emitted the chromium and mercury to the air.
- **Central and northwestern** small areas of New Mexico, where have higher average PEI of mercury and chromium than other small areas.

This study covered **10 metal components of PM<sub>2.5</sub>** in air-pollution-LBW association explorations.

It is the **first study** in New Mexico on maternal PM<sub>2.5</sub> metal exposures as LBW risk factors.

**Mercury and chromium in PM<sub>2.5</sub>** are positively associated with LBW rate in offspring.