

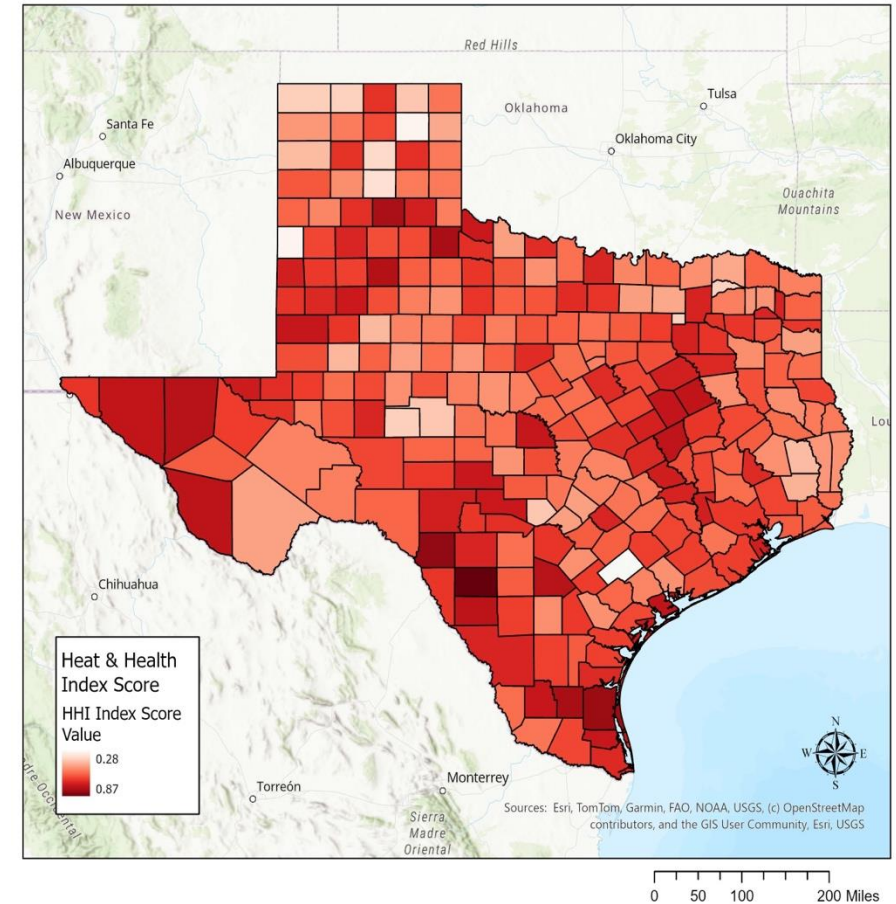
# Urban Heat, Green Space, Air Pollution, and Alzheimer's Disease & Related Dementias (ADRD) in Texas

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# BACKGROUND

- **Texas ranks 2<sup>nd</sup> in the U.S. for ADRD-related deaths.**
  - People with ADRD are more vulnerable to extreme heat, including problems with body temperature regulation, hydration, sleep, and heart health.
- **Texas faces a high heat burden, increasing the risk of heat illness, hospitalization, and death.**
  - Urban heat and traffic-related air pollution often occur together, leading to combined environmental stressors.
  - Green space can help reduce heat and improve air quality in urban areas.



# RESEARCH GAP & OPPORTUNITY

## ➤ **GAP: Limited ADRD environmental research**

- Few studies examine heat, air pollution & green space together
- Most focus on mortality or short-term cognition
- Neighborhood heat vulnerability remains unclear

## ➤ **Texas offers a unique setting**

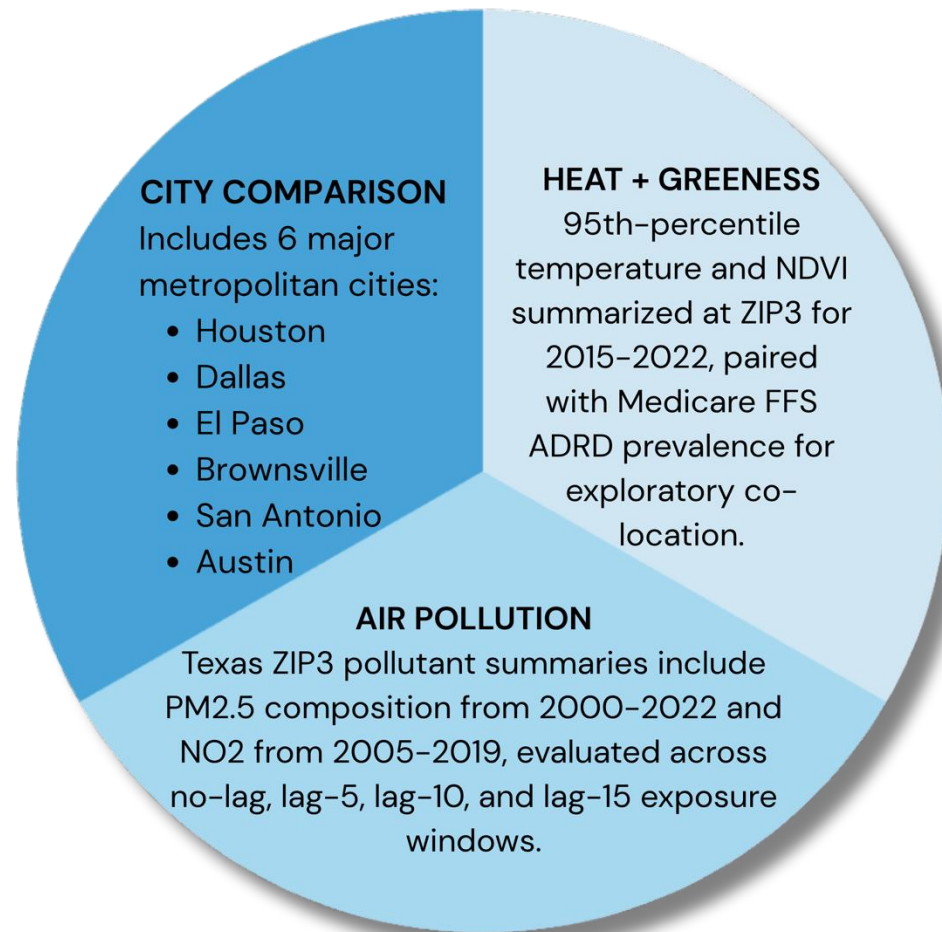
- Cities differ in heat, vegetation, and pollution
- Supports comparison of environmental exposures and ADRD risk

## ➤ **OPPORTUNITY: NASA Earth observations help fill data gaps**

- Ground monitoring is sparse
- EO products provide broad coverage of heat, vegetation & air pollution



# DATA & APPROACH



## ANALYTIC APPROACH

Conducted ZIP3-level ecological analyses of ADRD prevalence in relation to heat, greenness, and air pollution across Texas.

## STATEWIDE ANALYSIS

Summarized correlation, regression, and lag-window patterns to identify the most stable pollutant signals associated with ADRD.

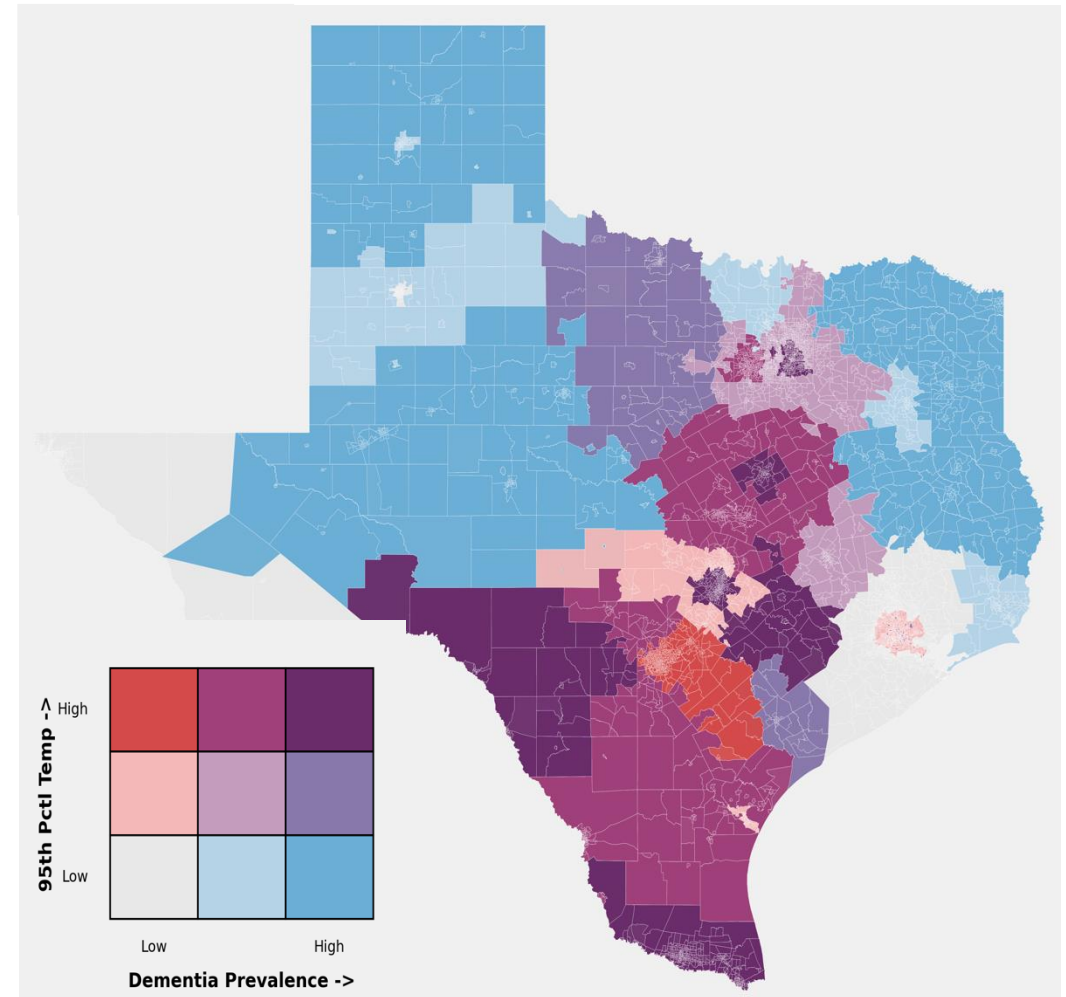
## CITY-LEVEL ANALYSIS

Compared descriptive exposure profiles across six major Texas cities and explored whether greenness may modify the heat-ADRD relationship.

## RESULTS: HEAT

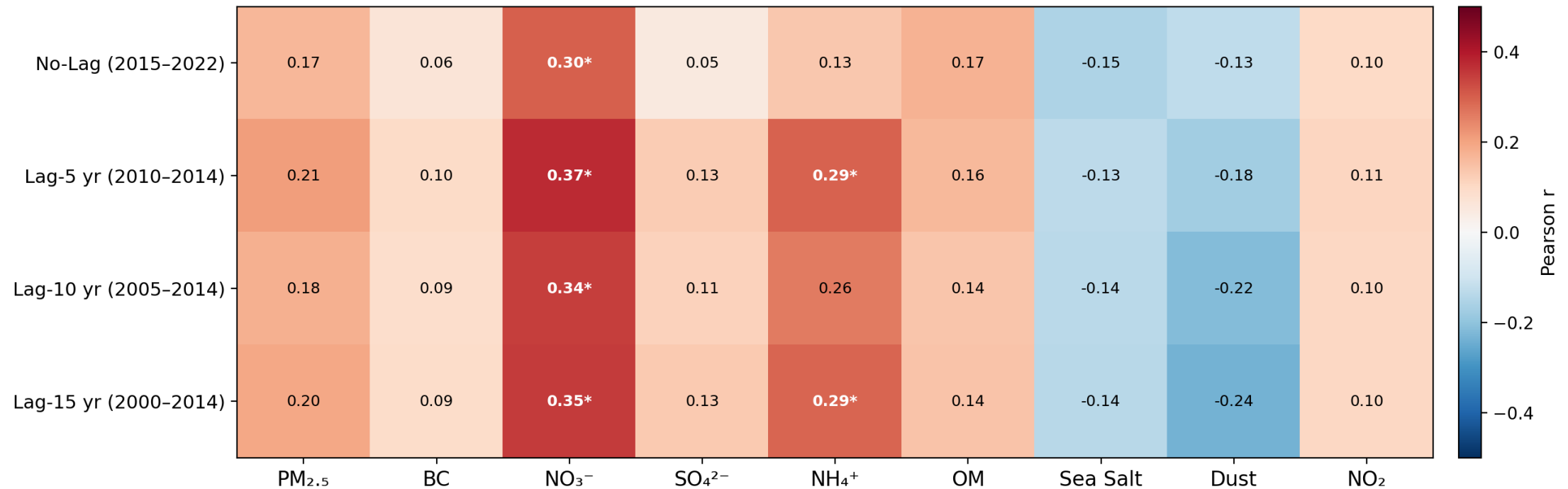
- Higher heat levels were observed in South and Southeast Texas, including Brownsville and San Antonio.
- Parts of Houston showed both high heat and high ADRD prevalence.
- Some cooler regions also had elevated ADRD prevalence, suggesting heat alone does not explain ADRD patterns across Texas.

Heat & ADRD Prevalence Across Texas (2015 - 22)



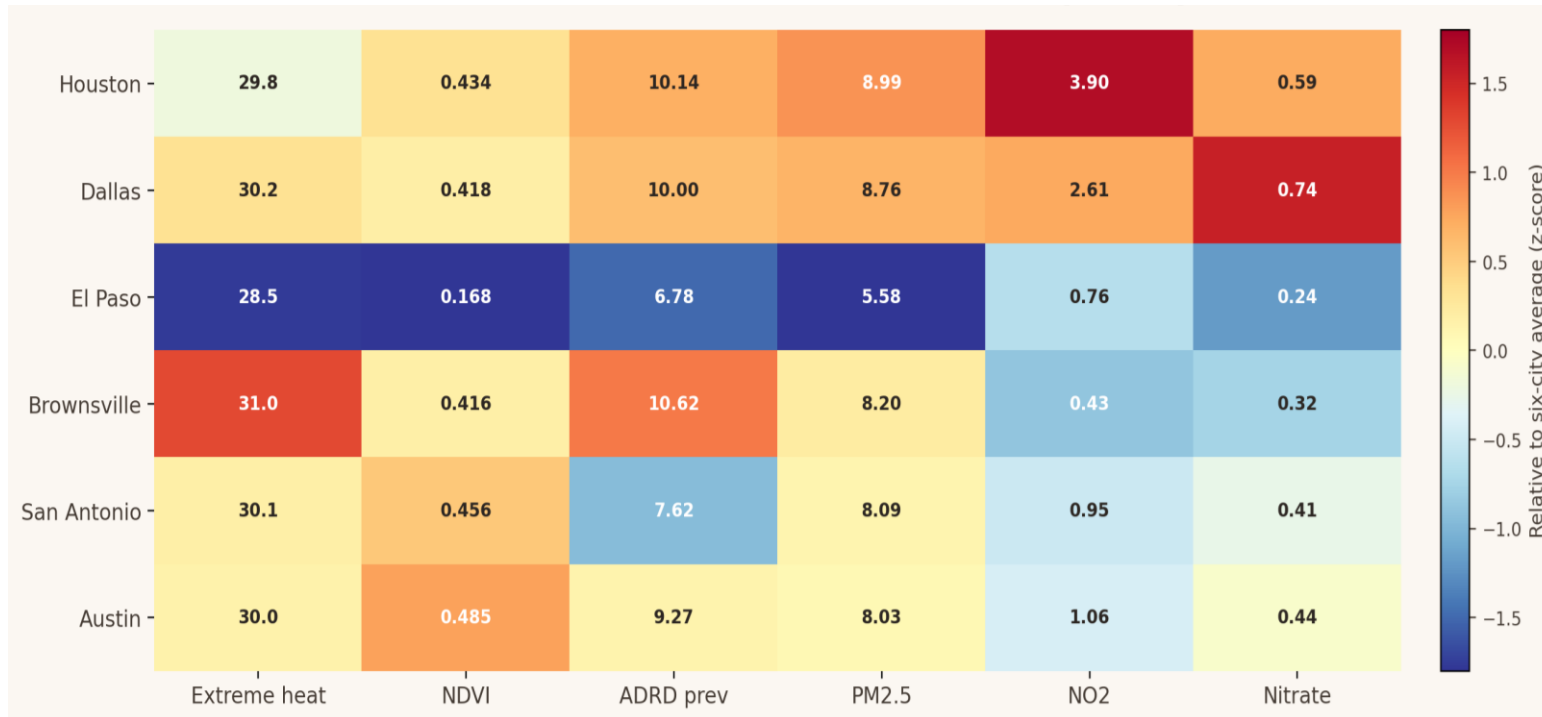
# RESULTS: AIR POLLUTION

Air Pollutants & ADRD Prevalence Across Texas ZIP3 Regions



- Nitrate (NO<sub>3</sub><sup>-</sup>) showed the strongest positive correlation with ADRD across all lag periods.
- Ammonium (NH<sub>4</sub><sup>+</sup>) also showed positive correlations, especially for longer lags.
- Dust and sea salt showed negative correlations, while PM<sub>2.5</sub> and NO<sub>2</sub> were weaker.

## RESULT: CITY COMPARISON



Environmental and ADRD Profiles Across Six Major Texas Cities

- Brownsville showed the highest extreme heat and highest ADRD prevalence among the six cities.
- Houston and Dallas had higher PM<sub>2.5</sub>, NO<sub>2</sub>, and nitrate levels compared with other cities.
- El Paso generally showed lower heat, pollution, and ADRD prevalence than the other cities.

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## SUMMARY & NEXT STEPS

- **Results:**
  - Preliminary evidence suggests that temperature alone is not enough for urban heat response planning
  - The combined pattern of heat, greenness, and air pollution is what distinguishes city vulnerability.
- **Limitations:** These are ecological analyses, without individual-level inference or full adjustment for social and behavioral confounding.
- **Next Steps:** Harmonize the ADRD outcome across heat, greenness, and pollution analyses; Use BHRC (individual) to test formal interaction terms; and move to finer spatial resolution for city-specific modeling.
- **Public Health and Policy Implications:** Urban heat response in Texas should be city-specific.
  - Houston and Dallas need stronger attention to the co-occurring pollution burden.
  - Brownsville and El Paso point to different heat-greenness contexts.
  - Cooling plans, canopy investments, and exposure communication should be coordinated rather than treated as separate programs when older adults with ADRD are the target population.

# Thank you!

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