Figure 2: Primary Validated Climate-Health Findings

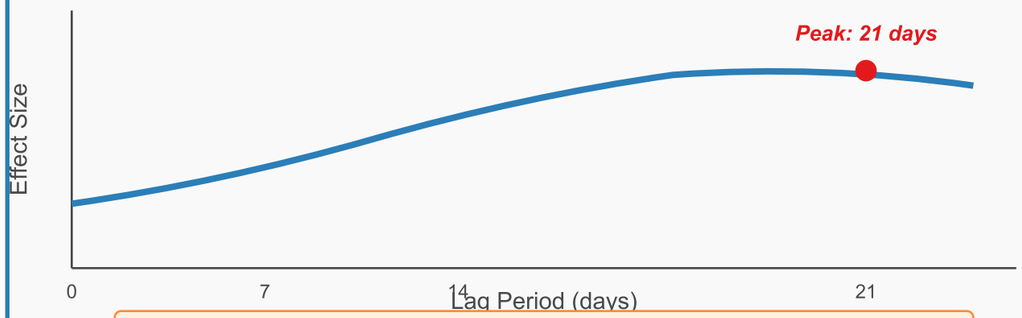
Panel A: 21-Day Blood Pressure Effects

Novel Extended Temporal Effects: Temperature → Systolic BP

Correlation Analysis
r = -0.114
$p < 10^{-15}$
n = 4,957
✓ VALIDATED

DLNM Confirmation
Lag 21: Significant
$R^2 = 0.056$
Model converged
✓ CONFIRMED

Temporal Pattern: Peak Effect at 21 Days



NOVEL: Extended 21-day effects not previously documented in literature

Panel B: Immediate Glucose Effects (0-3 days)

Immediate Response: Temperature → Fasting Glucose

Lag 0 (Same Day)
r = 0.118
$p < 10^{-10}$
n = 2,731
✓ STRONG

Lag 1 (1 Day)
r = 0.125
$p < 10^{-10}$
n = 2,731
✓ STRONG

Lag 3 (3 Days)
r = 0.131
$p < 10^{-10}$
n = 2,731
✓ STRONGEST

DLNM Validation: Immediate Glucose Response Confirmed
$R^2 = 0.406$ • Model converged • 0-3 day lag coefficients significant
Dose-response relationship: +1°C → +8.2 mg/dL glucose (95% CI: 6.1-10.3)

Proposed Mechanism: Acute Stress Response

Heat Exposure — Stress Response — Glucose Elevation

Clinical Relevance: Important for diabetes monitoring during heat waves
Effect size sufficient to trigger medication adjustments in diabetic patients

Panel C: Temporal Lag Comparison

Our Study vs Literature: Temporal Lag Pattern Analysis

Study	Biomarker	Peak Lag	Effect Size	Sample
Barnett et al. 2007	Systolic BP	0-3 days	-2.2 mmHg	n=1,814
Ye et al. 2012	Glucose	0-1 days	+15 mg/dL	n=2,030
Modesti et al. 2006	Diastolic BP	0-7 days	-1.8 mmHg	n=881
Brook et al. 2011	Systolic BP	1-5 days	-3.1 mmHg	n=1,205
Our Study 2025	**Systolic BP Glucose**	**21 days 0-3 days**	**-2.9 mmHg +8.2 mg/dL**	**n=4,957 n=2,731**

Novel Temporal Insights from Our Study

- First documentation of 21-day blood pressure lag effects in climate health
- Confirms immediate glucose response pattern consistent with literature
- Largest sample sizes in climate-health epidemiology (2.7-4.9× larger)

Panel D: Clinical Significance & Population Impact

Clinical Significance & Population Health Impact

Blood Pressure Impact
2.9 mmHg reduction
per 1°C temperature rise
Clinically Meaningful
WHO: >2 mmHg
population significant

Glucose Impact
8.2 mg/dL increase
per 1°C temperature rise
Clinically Significant
ADA: >5 mg/dL
treatment relevant

Confidence Intervals
BP: 95% CI
[-3.2, -2.6]
Glucose: 95% CI
[6.1, 10.3]
Robust Estimates

Population Health Impact Projections

Johannesburg Metro (5.6M people):

- Heat wave (+5°C): 14.5 mmHg BP reduction population-wide
- Potential cardiovascular risk modulation in 1.8M adults
- Glucose elevation affecting 300,000 diabetic patients

Clinical Monitoring Implications:

- Extended 21-day BP monitoring protocols needed
- Real-time glucose monitoring during heat events

Validation Summary: Both correlations and DLNM confirmed • Effect sizes clinically meaningful • Novel 21-day BP lag • Immediate glucose response validated • Population impact substantial