Study Design & Methodological Framework
Comprehensive Urban Climate-Health Analysis

STUDY POPULATION

Location	Johannesburg, South Africa (Urban African cohort)
Total Sample	**N = 18,205 participants**
Study Design	Cross-sectional with temporal lag structure (0-21 days)
Climate Metrics	Daily temperature & apparent temperature measurements

Category	Biomarker	Sample Size	Statistical Power
Cardiovascular	Systolic Blood Pressure	4,957	>0.99
	Diastolic Blood Pressure	4,957	>0.99
Metabolic	Fasting Glucose	2,731	>0.99
	Total Cholesterol	2,497	0.80-0.95
Immune	CD4 Cell Count	1,283	0.80-0.95

STATISTICAL METHODOLOGY

Primary Analysis	Pearson correlation for continuous climate-biomarker relationships
Confidence Intervals	Bootstrap method (1,000 iterations) for 95% CI estimation
Significance Testing	Permutation testing (10,000 permutations) for robust p-values
Multiple Testing	Bonferroni correction (α = 0.0125) + FDR adjustment
Lag Analysis	Structured periods: 0, 1, 2, 3, 5, 7, 10, 14, **21 days**
Validation	Distributed Lag Non-linear Models (DLNM) confirmation

NOVEL CONTRIBUTION

First report of 21-day cardiovascular adaptation to temperature in African urban population

This extended temporal effect has critical implications for climate health monitoring and intervention timing in vulnerable populations