



Heat Vulnerability Index: Scaling up through DHIS2



One local vulnerability model → many health systems, via the platform that already runs them

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An open-source health platform across 80 LMICs, scaling a Johannesburg heat vulnerability index — no parallel infrastructure, no vendor lock-in.

135	5	80	8	0
JHB wards analysed	hotspot clusters	LMICs running DHIS2	African pilots ready	parallel infrastructure

Background

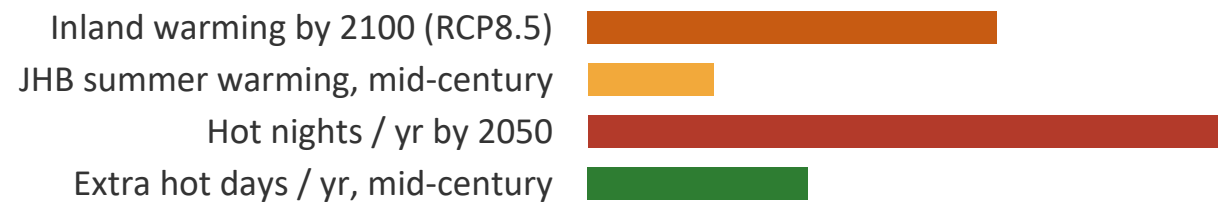
African cities face escalating heat exposure, yet fine-scale, health-actionable vulnerability data are scarce.

Johannesburg (6.1 M people; record 38 °C in 2016) carries an apartheid-era spatial legacy: townships ~6 °C hotter than countryside; informal corrugated-iron housing reaches 15 °C above modern dwellings. All-cause mortality rises ~0.9 % per °C above the 18.7 °C apparent-temperature threshold (2.1 % among ≥ 65 yr).

DHIS2, the open-source HIS used in **80 LMICs**, now offers a **Climate & Health** module and the model-agnostic **CHAP** platform — a route to operational practice without bespoke infrastructure.

Climate Projections for South Africa

Sources: IPCC AR6 WG-II (2022) · Souverijns et al. 2022 · Parker et al. 2025



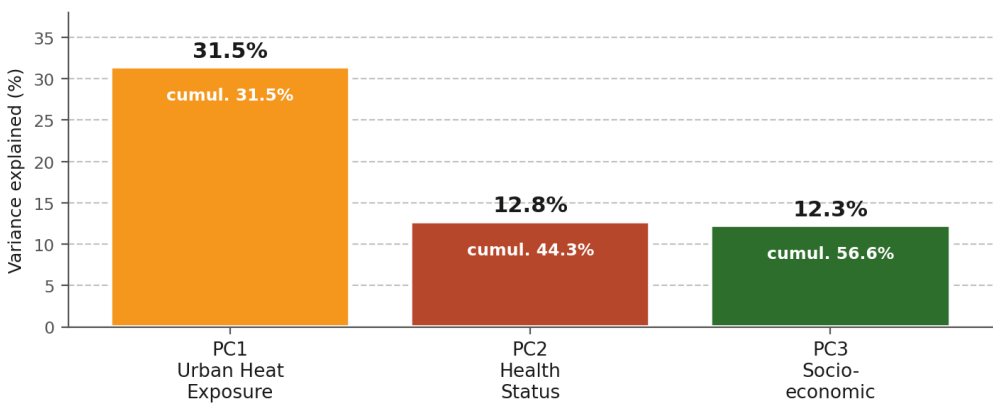
Methods

Study area: 135 of JHB's 137 wards (~6.1 M). GCRO Quality of Life 2020–21: 8 215 respondents, ~60 / ward.

Environmental: Landsat 8 L2-C2, Dec 2020 – Feb 2021, 30 m. LST via split-window in Google Earth Engine.



Key Findings — PCA + LISA



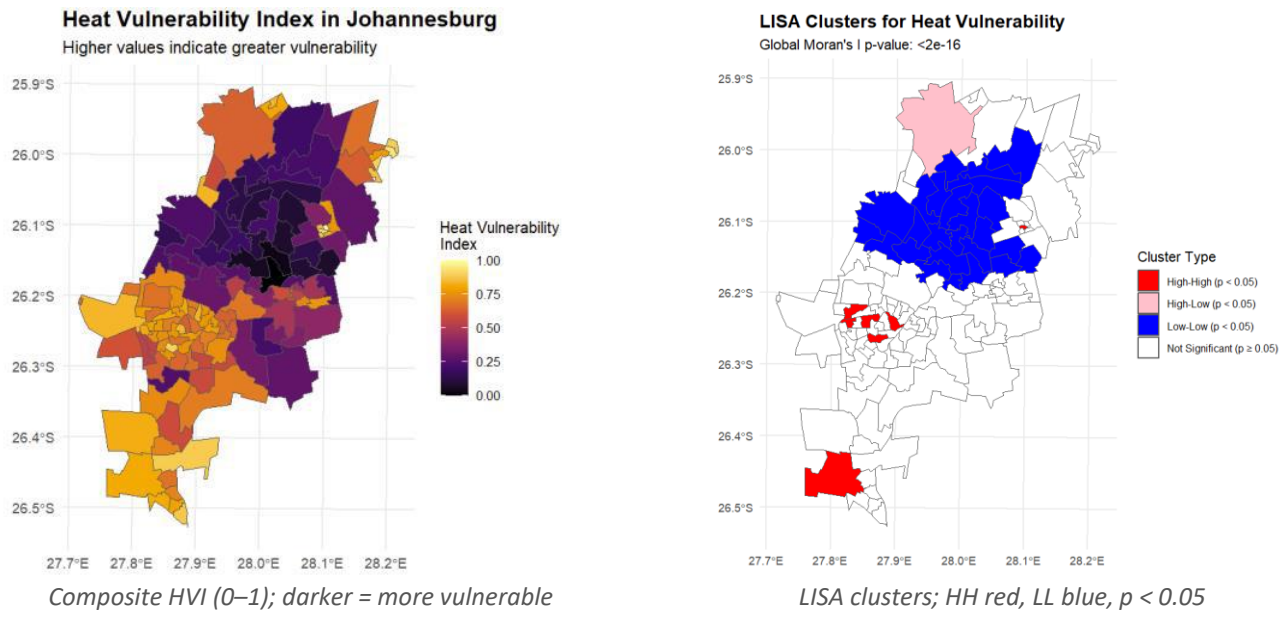
PC1 captures the urban-heat signal ($UTFVI \cdot LST \cdot NDBI \cdot -NDVI$); Moran's $I = 0.42$, $p < 0.001$ — vulnerability is spatially structured. Full loadings & LISA quadrants in Parker et al. 2025 [QR ↗].

Humidity	Spatial scale	Pandemic context
AT, HI, WBT, WBGT use assumed 50 % RH (JHB annual mean ≈ 50 %; range 30 – 70)	Ward-level analysis is subject to MAUP. 18.5 % of wards show within-ward $\sigma > 1$ °C	GCRO 2020 – 21 wave overlapped COVID-19. SES indicators shifted (unemployment 3.8)

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Acknowledgements
Funding: HE²AT Center is supported by the NIH Common Fund, managed by the Fogarty International Centre (FIC), National Institute of Environmental Health Sciences (NIEHS), and OD/Office of Strategic Coordination (OSC) of the National Institutes of Health (NIH award number: U54TW012083). Disclaimer: The poster content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. Wits HREC ref. 200606. Authors at Wits hold indirect fossil-fuel investments via institutional pension funds.

Results — Johannesburg HVI

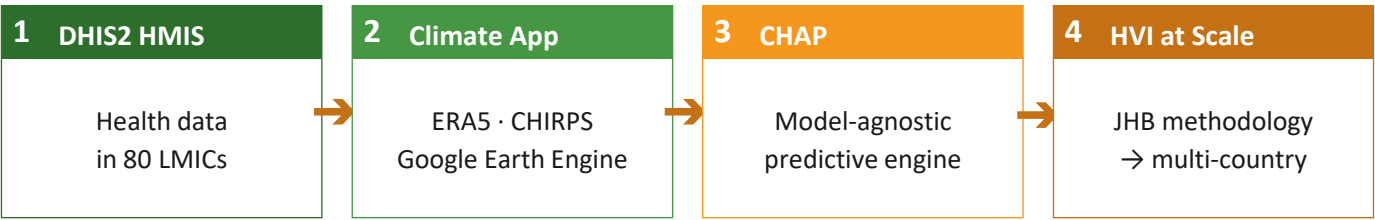


Five high-vulnerability clusters across 135 wards. Alexandra Township anchors the worst (LST 29.8 °C, NDBI 0.08, 89 % public-HC reliance, 70 % hunger); Tembisa, Tshepisoong, Lenasia South, and Soweto follow with distinct exposure × sensitivity profiles.

Strategic value

Open source, no lock-in End-to-end open: DHIS2 core, CHAP engine, indicator code openly published.	Runs on existing MoH stack Lightweight ops — no parallel cloud or GPU pipeline required.
Avoids bespoke duplication One indicator structure, ported across countries via CHAP.	Builds on existing capacity HISP networks already train MoH staff in DHIS2 — no new training stack.

Scaling Pathway: research → practice



DHIS2 deployment + use cases

DHIS2 Climate & Health currently deployed across 8 African countries	Resource allocation Cooling centres & healthcare capacity in identified hotspots
Urban planning Long-term zoning informed by exposure + sensitivity layers	Early warning Auto alerts when ERA5-HEAT forecasts intersect vulnerability

Conclusion

Validated. Five vulnerability clusters across 135 wards; sensitivity-stable; open-source.

Ready to scale. CHAP's model-agnostic interface ports the JHB indicator to any DHIS2 deployment — no code, no DTAs.

Next. Pilot HVI export to a DHIS2 instance; integrate ERA5-HEAT for automated early warning.



References
[1] Parker C, et al. (2025) Int J Biometeorol 69:2501–2517. [2] IPCC AR6 WG-II (2022). [3] Cutter SL et al. (2003) Soc Sci Q 84:242–61.
[4] Reid CE et al. (2009) EHP 117:1730–6. [5] Jiménez-Muñoz et al. (2014) IEEE TGRS. [6] Souverijns et al. (2022) Urban Climate 46:101331.
[7] DHIS2 Climate Tools — climate-tools.dhis2.org [8] Code: github.com/Logic06183/data_sources