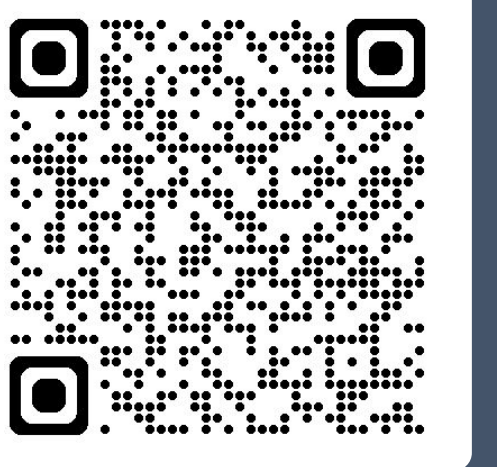




The Measurement Blind Spot

Mobile network operators and crowdsourced providers report improving KPIs, yet users in marginalized urban communities still experience slow, unreliable connectivity. Two measurement failures compound:

- **Administrative aggregation is too coarse.** Operators track performance at the administrative-boundary level (a census tract, or in Bangladesh a Thana). A poorly served settlement can sit inside a boundary that looks high-performing, so its degradation disappears into the average.
- **Crowdsourcing undersamples the poor.** Speed tests come mostly from wealthier users, so low-income, low-literate settlements rarely appear on platforms like Ookla.

CENTRAL QUESTION

What is the lived connectivity experience of communities that crowdsourced platforms and operator KPIs render invisible, and how do network planners interpret or ignore the gaps that independent measurement reveals?

iQoE & Likely Coverage – Motivating Examples

iQoE (indicative Quality of Experience) is a normalized broadband index built from Ookla speed tests (Q1'19 – Q2'24), aggregated to Bangladesh's ~650 Thana boundaries, mirroring how planners assess performance. It normalizes downlink, uplink, and latency against national percentiles.

$$\text{Normalized DL} = \frac{\text{Median DL speed (admin boundary)}}{95\text{th percentile DL speed (same level admin boundary)}}$$

$$\text{Normalized UL} = \frac{\text{Median UL speed (admin boundary)}}{95\text{th percentile UL speed (same level admin boundary)}}$$

$$\text{Normalized Latency} = \left(\frac{\text{Median Latency (admin boundary)}}{5\text{th percentile latency (same level admin boundary)}} \right) - 1$$

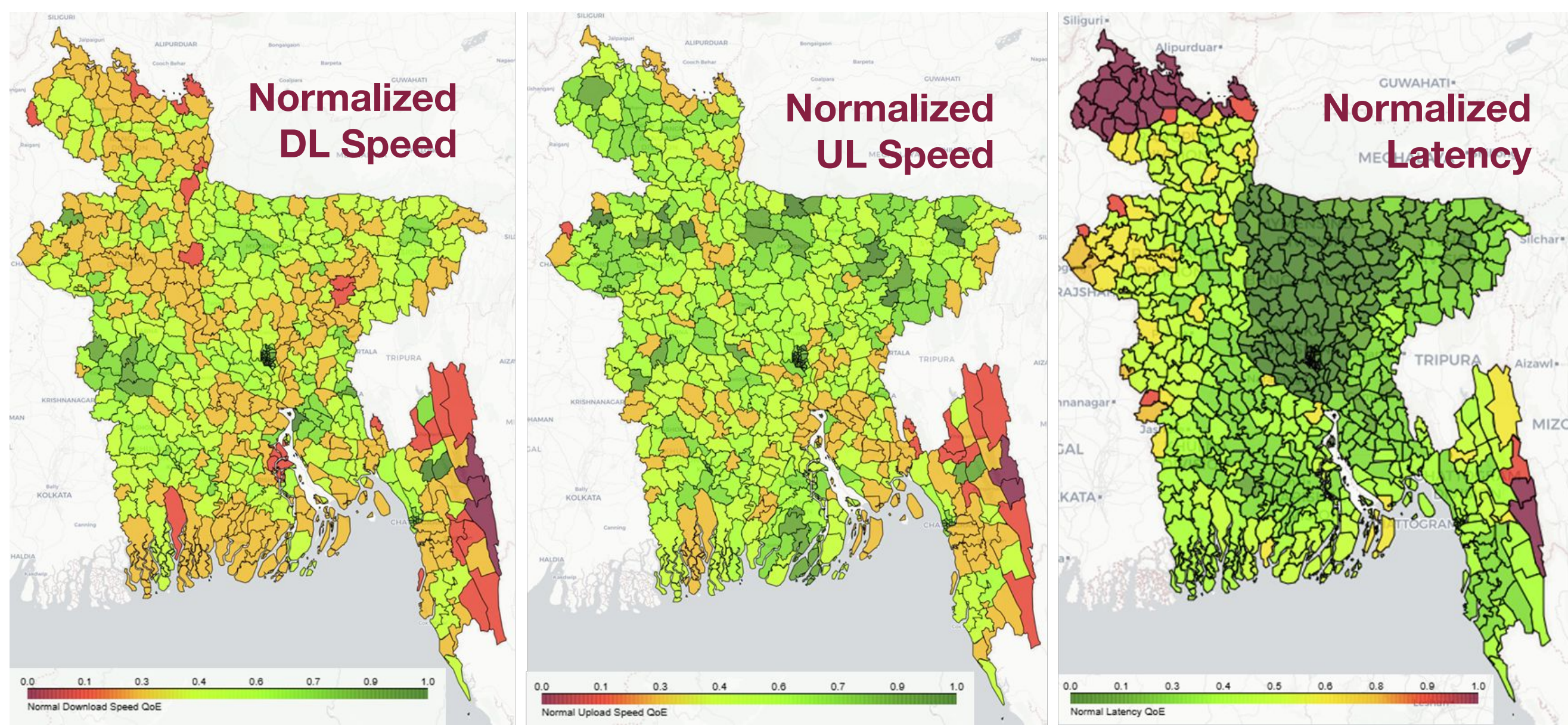


Figure 1. iQoE heatmaps indicate relatively higher Ookla speeds (green) in major metropolitan cities compared to rural and suburban areas

Likely Coverage, the fraction of a Thana's tiles with any speed test, measures how far independent measurement reaches. Low values flag the communities data barely sees, and it correlates strongly with wealth (Figure 2).

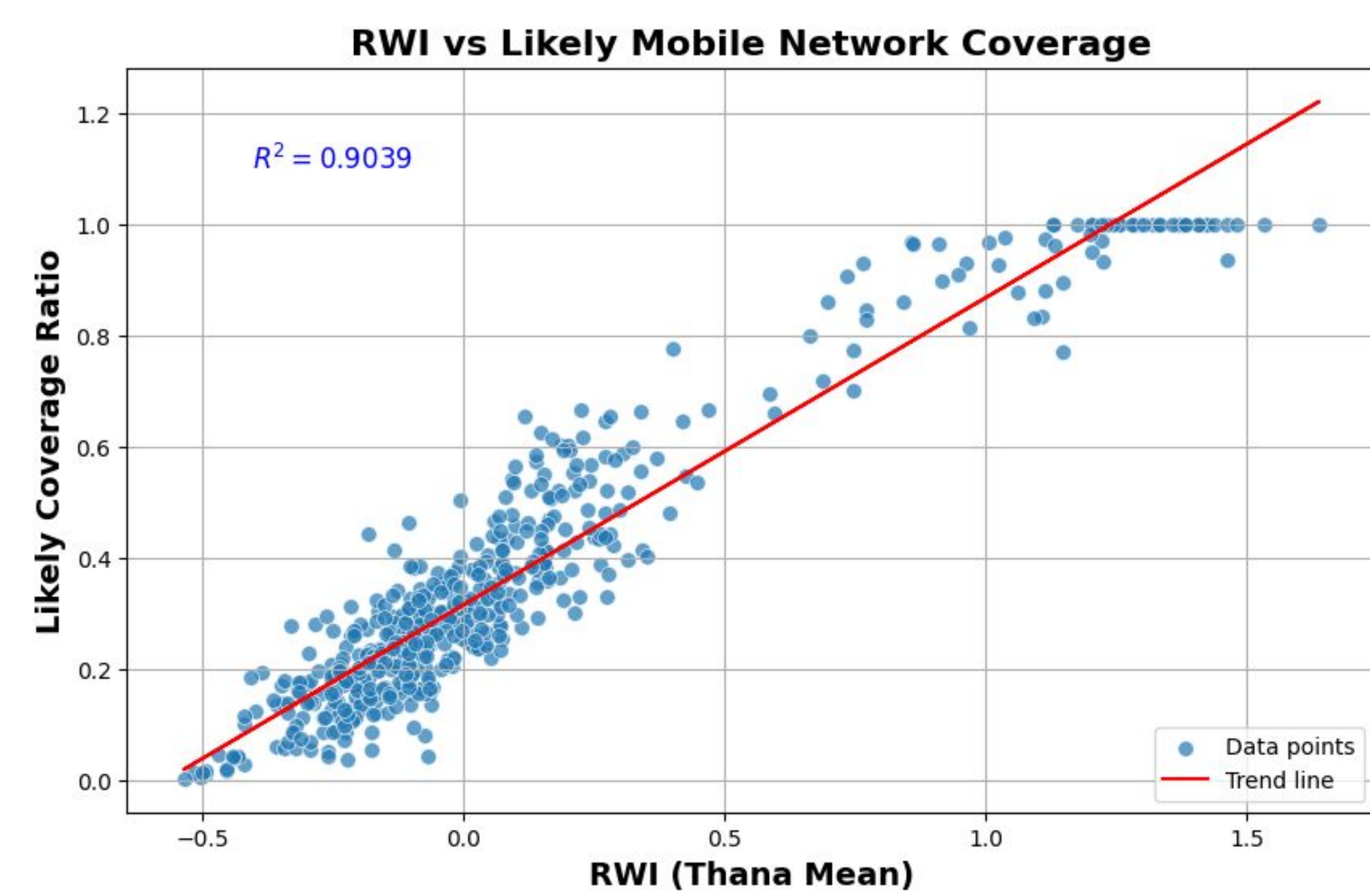


Figure 2. Likely coverage rises with relative wealth: measurement density and quality advantage compound.

Three findings that motivate the study

25%
of quadkey tiles hold any
speed-test observation

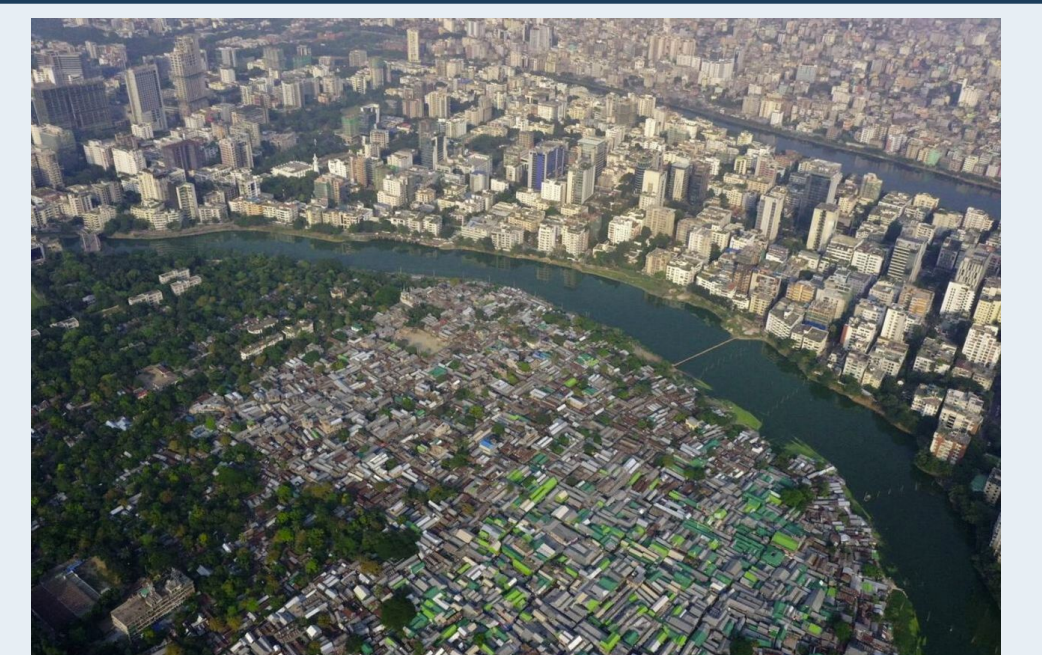
$R^2=0.90$
coverage vs. wealth
across ~650 Thanas

6→23
Mbps national median DL,
masking spatial disparity

What We Propose (Korail Field Study)

THE BLIND SPOT WE AIM TO MEASURE

Korail, Bangladesh's largest urban slum (~200K residents), sits inside Gulshan Thana, one of Dhaka's wealthiest units. The Thana average reads healthy while Korail is erased, invisible to both crowdsourced undersampling and geographic aggregation.



A Android measurement app

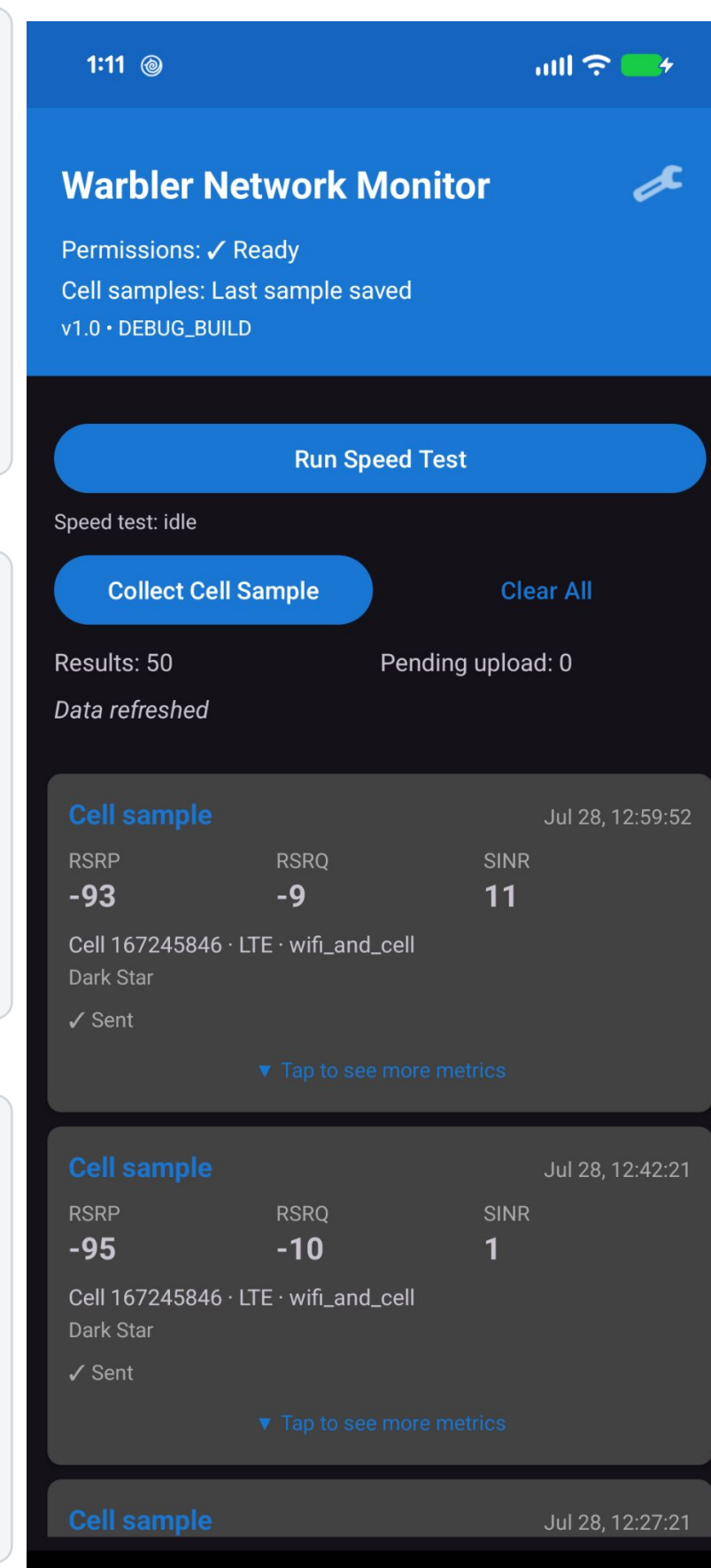
Active and passive measurements run on residents' own devices, logging mobile signal strength and quality, DL + UL speed, latency, jitter, and attached-cell information during idle and natural use.

B 7-day diary study + pre / post interviews

n=15–20 residents, snowball-recruited via a field coordinator. Twice-daily WhatsApp prompts capture in-the-moment failures and coping. A short network tour grounds entries in physical space.

C Network-planner interviews

~6 planners interpret triangulated vignettes built from iQoE maps, app traces, and diary narratives, surfacing where KPI dashboards and lived reality diverge.



Hypotheses

- **H1:** Operator KPIs overstate the performance users in marginalized communities experience.
- **H2:** Crowdsourced tests under-represent these settlements, where coverage is sparse relative to wealthier areas.
- **H3:** Residents cope systematically: switching SIMs, seeking better-signal spots, rationing data.
- **H4:** Institutional pressures push planners to deprioritize informal settlements.

Contributions

1. **iQoE diagnostic.** Empirical evidence that standard frameworks obscure intra-urban inequality; a replicable method for other Global South contexts.
2. **Ground-level account.** App + diary produce the first record of lived connectivity in a community structurally invisible to measurement.
3. **Organizational view.** Planner interviews surface how KPI regimes decide what gets measured, what gets invested in, and who is left behind.

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