

Reaching the Unreached: Empowering the adoption of data-driven vaccination strategies in West and Central Africa

Supervisors: Manuel Garcia-Herranz, Niccolò Cirone, Yves Jaques, Kyriaki Kalimeri & Rocco Panciera
Faculty advisor: Robert Freund



Martin Bogaert



Tommaso Salvatori

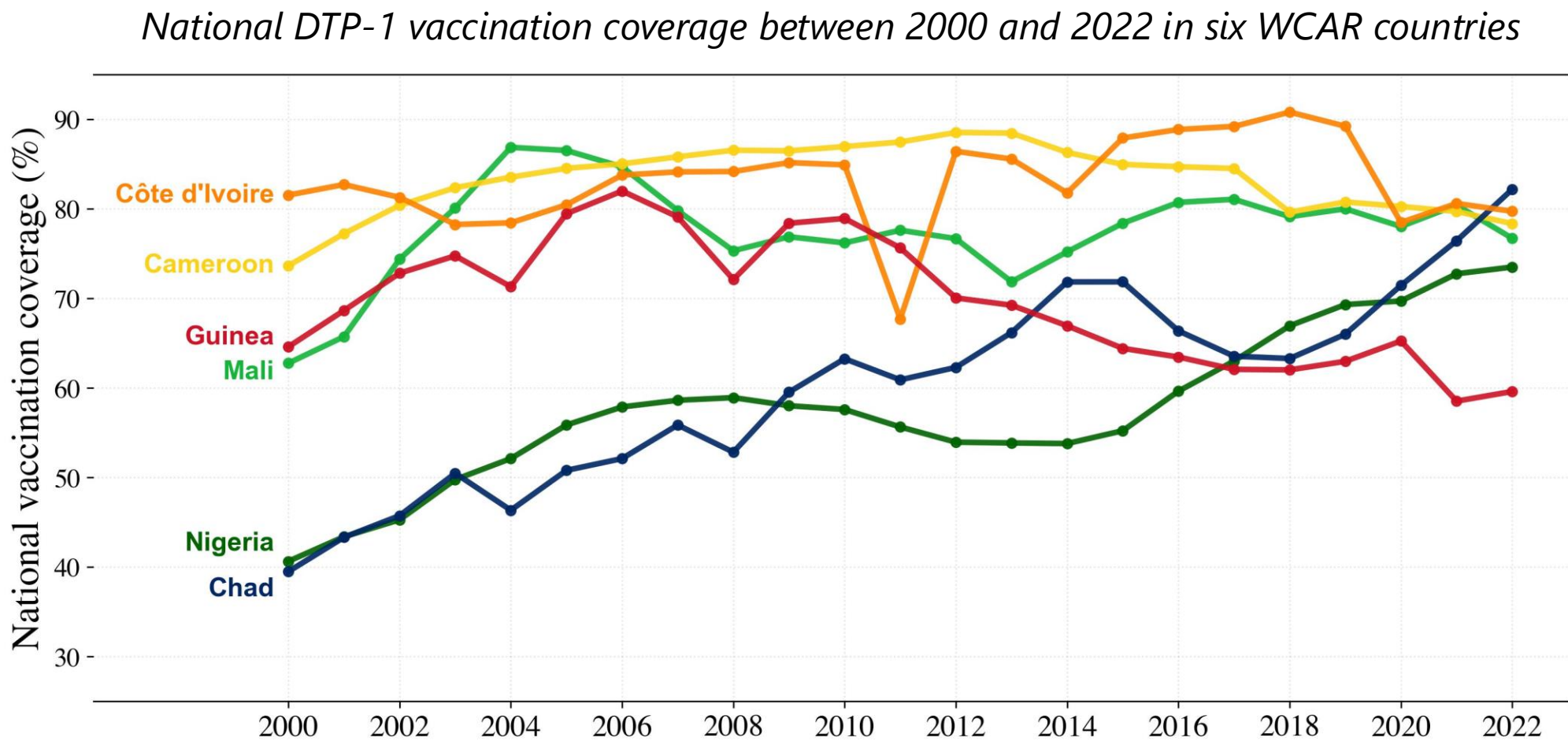
Context

6 million

children in West and Central Africa (WCAR) have never received a single dose of life-saving vaccines, so-called *zero-dose children*.

The percentage of children who have been administered a first dose of the diphtheria-tetanus-pertussis (DTP-1) vaccine is used as a proxy for the health of a vaccination system.

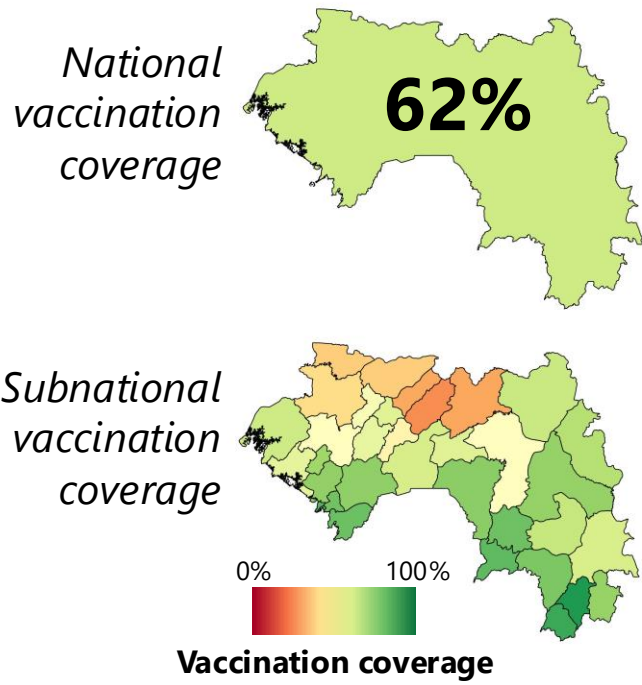
In WCAR, the vaccination coverage to DTP-1 is the **lowest in the world**, contributing to infant mortality rates **as high as 10%**.



Sustainable vaccination coverage levels are **hard to sustain** in resource-constrained environments.

Problem statement

National level estimates are **inactionable** and **mask regional inequalities**.



Reported vaccination data reported by countries is **prone to large errors**.

54%

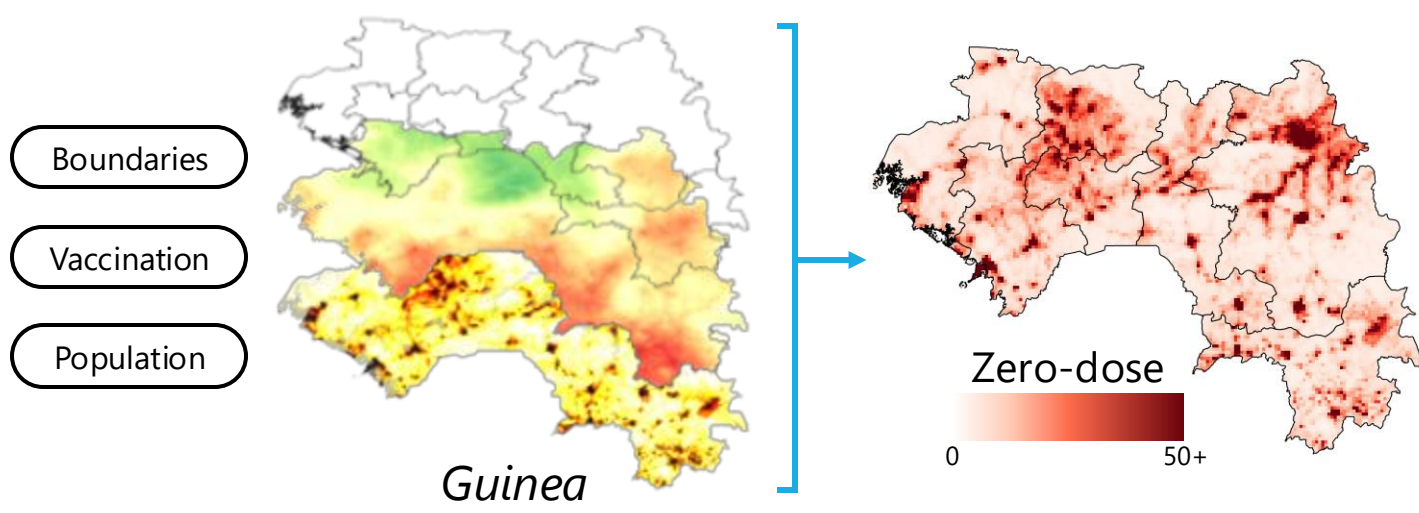
of countries have administrative systems that report **more than 100% coverage** in more than a quarter of their regions.

In such uncertain environments, it is **challenging** to:

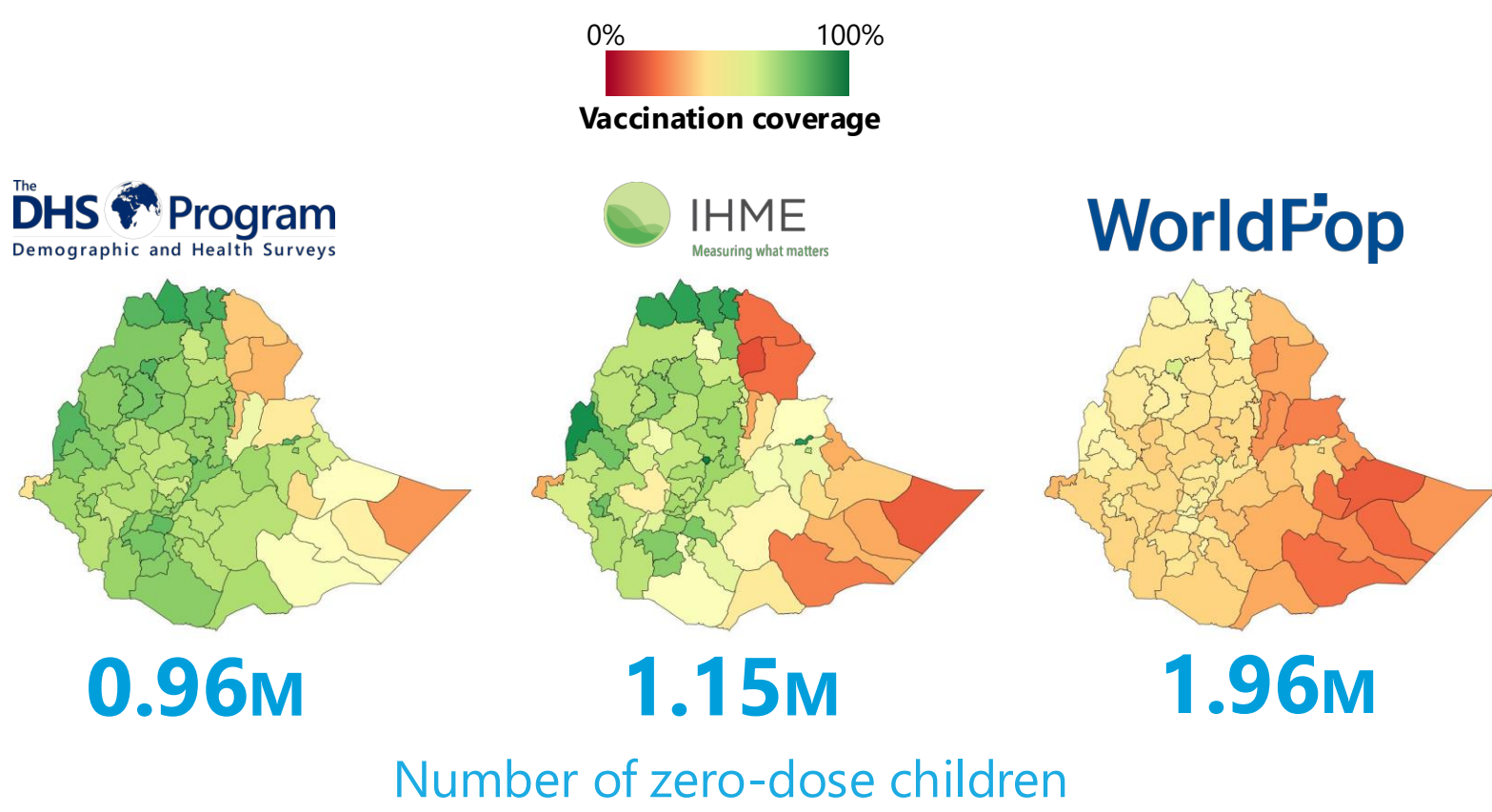
- Plan logistics of immunization campaigns
- Identify regions that require urgent attention
- Allocate vaccination, human or financial resources efficiently

Methodology

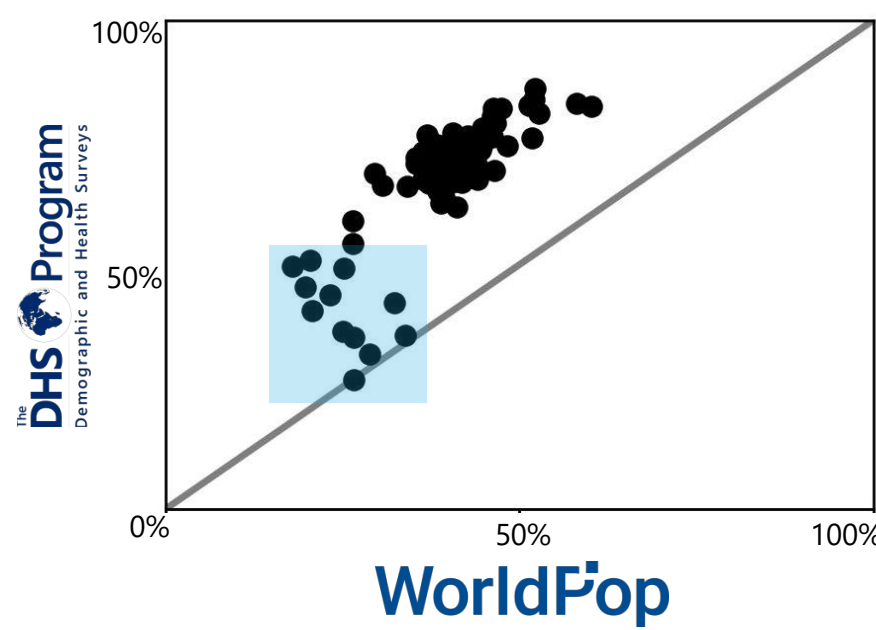
To locate zero-dose children, a **vaccination coverage** map is multiplied by a **population** map, and overlaid by a set of **boundaries**. For each region, the sum of pixels provides the total number of zero-dose children.



Pre-existing models



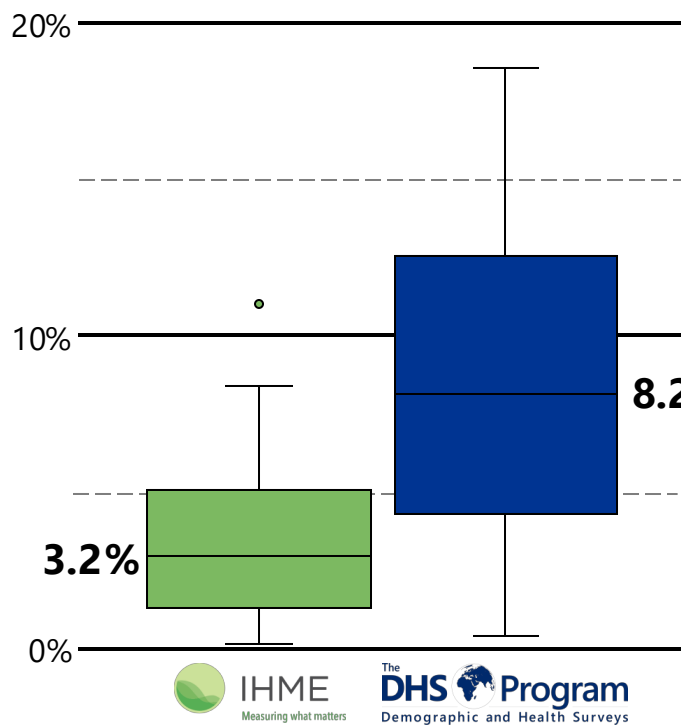
Scatter plot of subnational vaccination coverage estimates in Ethiopia in 2016



Top-6 least covered regions by model in Ethiopia

WorldPop	DHS Program
Afder	Doolo
Jarar	Zone 1
Korahe	Zone 2
Nogob	Zone 4
Siti	Zone 5
Zone 4	Nogob

Distribution of absolute difference to national WHO/UNICEF estimates across 34 datasets



In 2016, the differences in vaccination coverage models of Ethiopia lead to a discrepancy of **1 million zero-dose children**.

At the subnational level, the models disagree on regional vaccination coverage by as much as **28%**. Leading to large discrepancies in the rankings of worst-performing regions.

Across 34 dataset comparisons, the models disagree on national vaccination coverage by **5%** on average

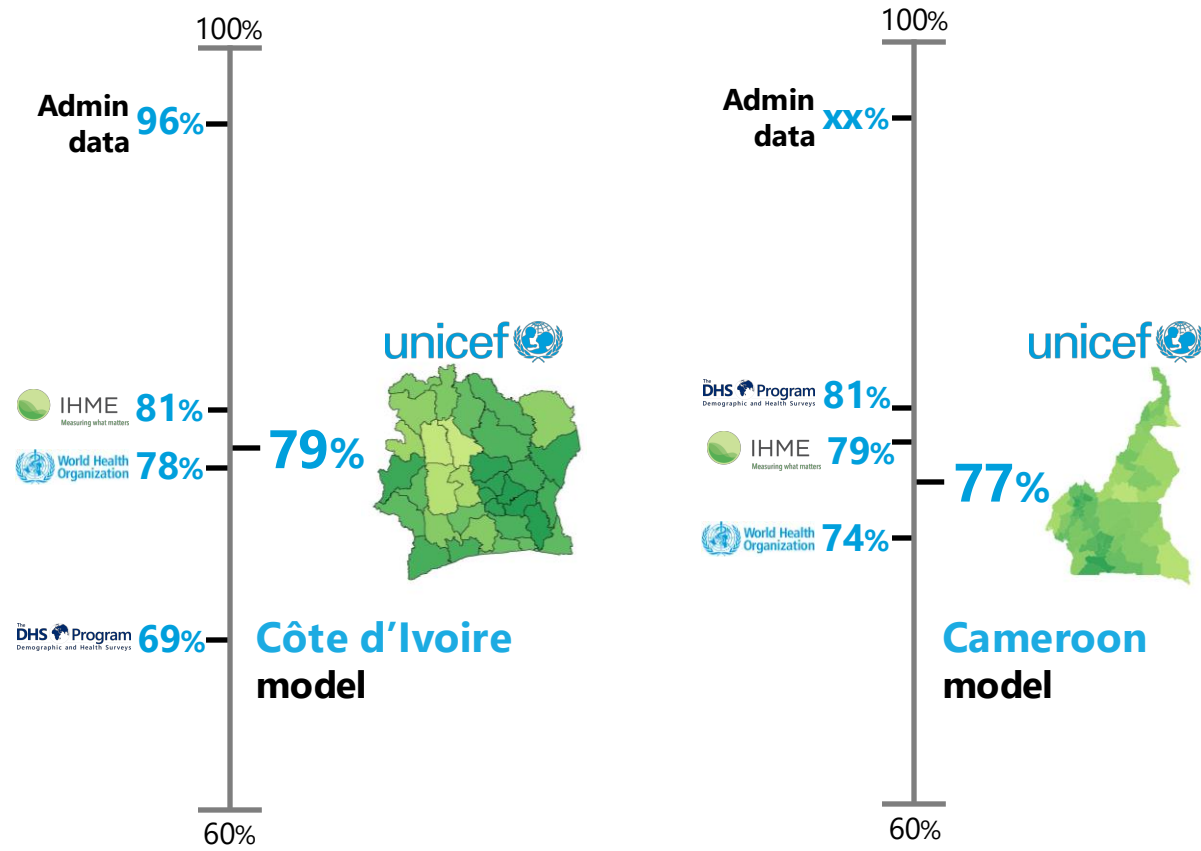
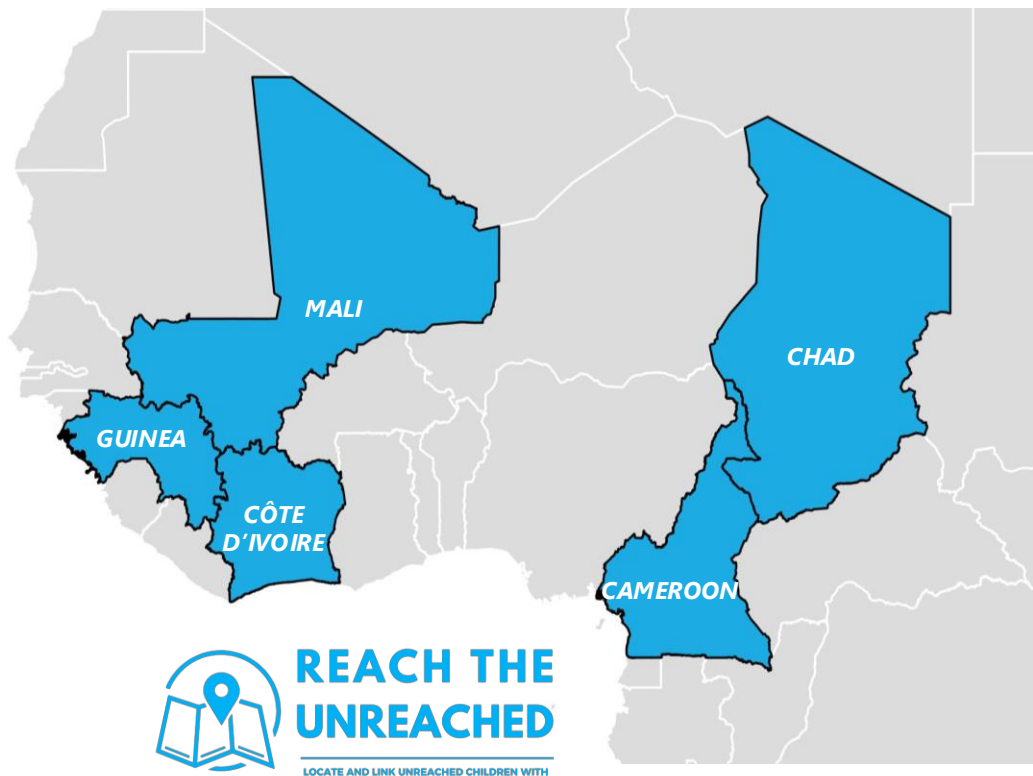
UNICEF models

Reach the Unreached initiative

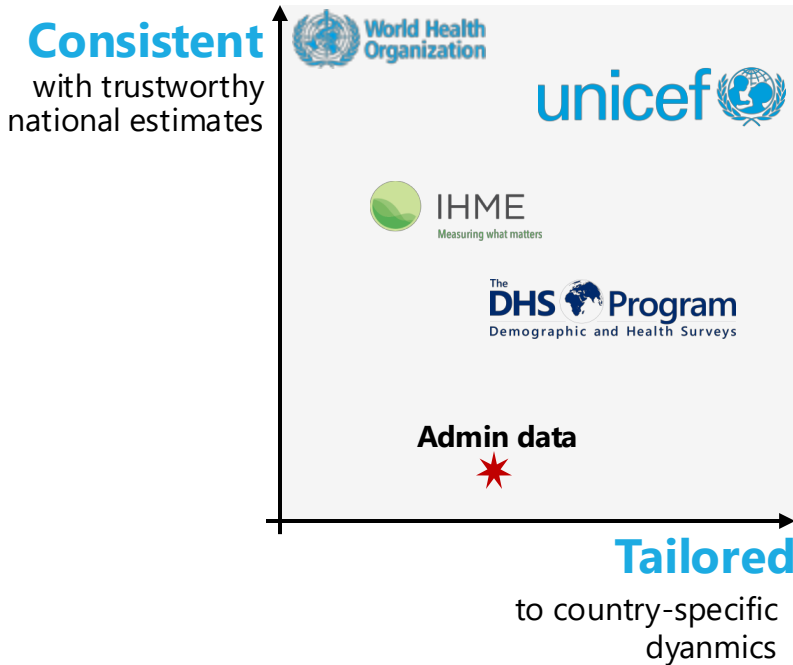
- Consulting with local governments
- Developing technical capacity for sustainable deployment
- Aiming to produce most accurate vaccination maps
- Supporting **programmatic changes** in immunization planning

Vaccination coverage models

- Collaboration with project stakeholders
- Country-specific modeling to capture **unique national context**
- Tailored** predictor selection



Qualitative assessment of vaccination coverage models



In Amadou's eyes

"These maps have potential for **high-impact**"



"They make it **obvious where to act** and prioritize campaigns"

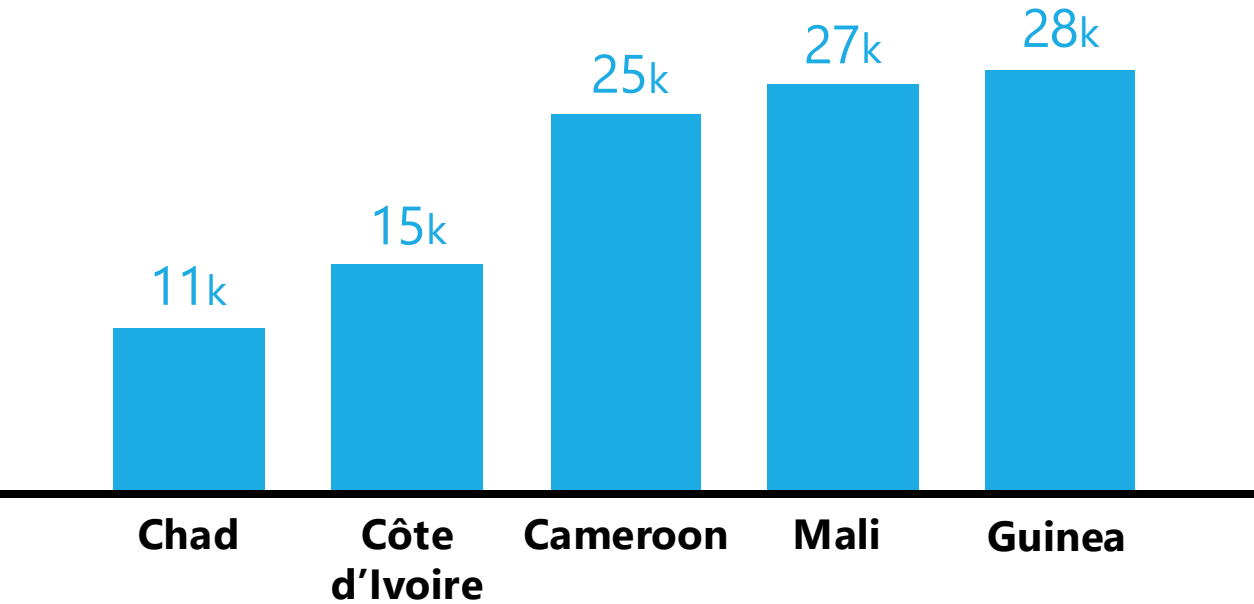
"They can **help us better allocate** vaccination, human and financial resources"

- **Amadou** participated in vaccination campaigns in some of the most remote regions of Guinea, where data quality introduced significant challenges

Potential impact

106,000

child deaths could be avoided every year in the 5 countries by achieving **95%** coverage*



6,500

child death could be prevented for **every 1% increase** in vaccination coverage

Our contribution

"Their analysis **strengthened organizational trust** in UNICEF's models, leading to renewed commitment from immunization managers – like Amadou – in using the resulting datasets for planning and decision-making"

- **Niccolò** Reach the Unreached Lead