ATLAS

a comprehensive data engine for global health equity and security
THE PROBLEM

The world’s most marginalized populations are digitally invisible, undercounted, and underserved.

Although health risks and outcomes vary considerably by district, standard practice of modeling key health indicators at national levels obscures dramatic subnational inequities. Moreover, public health systems rely on poor-quality, incomplete, fragmented data that is slow and expensive to collect on the ground. Without actionable data, improving population health is impossible, which deters public and private investors from communities with poor data infrastructure. Numbers drive policy, so this market failure accelerates systematic exclusions of the world’s marginalized populations. Information gaps exacerbate vulnerabilities to health crises. As a result, blind spots become hot spots.

HOW IT’S TRADITIONALLY DONE

Traditional demographic health surveys and infrastructure assessments are collected by consultants or enumerators. This data collection is often executed on a fixed schedule, remains manual and resource-intensive, and is narrowly designed to validate specific information. The collection agents are not motivated to ensure high-fidelity collection, and communities are rarely informed about results. As a result, traditional methods perform poorly in two crucial areas: continuous surveillance (e.g., civil registration and vital statistics) and highly fluid global health security threats, where timely feedback is crucial. In both scenarios, demographic health indices often collapse, leaving senior health leadership and frontline responders, respectively, paralyzed on where to act.
Atlas will unite, standardize, and map population data in order to generate insights that address health inequities. Our data engine will push actionable, real-time insights to frontline workers who build trust within communities and optimize health system effectiveness. The platform’s user experience (UX) will excel in providing frontline workers compelling incentives to share their insights with colleagues as aggregated contributions to a comprehensive stream of public health data, shown in time and space. The framework for the data stream is generated from satellite images and enriched with field based insights. Atlas will drive a virtuous cycle of data-driven insights, action and investment.

Atlas comprises three core elements:

**Satellite Analytics**
Facilitating continuous, local-level entry of household records and area infrastructural information into an increasingly accurate model of population health, shown in time and space.

**Cross Modal Machine Learning**
That (a) generates annotated spatial information from raw satellite images (b) identifies areas where health insights require new granular data collection and routes field-level users to fill information gaps and (c) pushes insights on health relevant local context, trends and risks to users at all levels.

**Social Self-Surveys**
For field, mid, and high-level users; the mobile platform is designed for scaling driven by continuously improving the social dynamics of use.
ATLAS IS A DATA ENGINE THAT GENERATES A RICH STREAM OF HYPER-PRECISE (HOUSEHOLD-LEVEL) HEALTH INFORMATION, SHOWN IN TIME AND SPACE.
How Atlas does it

The data engine illuminates blind spots in demographic and health information by analyzing inputs from frontline workers and satellite-derived images. Machine-learning algorithms continuously refine epidemiological estimations around these blind spots by actively routing health workers to collect fresh data efficiently and as needed so that insights delivered to policy and care-delivery managers meet optimal quality standards. Atlas’ accuracy increases with field-based annotations and access to collateral information, which improve algorithm performance. Focus on low-literacy frontline workers in low-resource settings will guide the user-experience design, platform architecture, and scalable implementation of Atlas. The data engine can house existing demographic health surveys and infrastructure assessments. However, it is optimized for communities where information sources are out of date or absent.
Remote sensing identifies information gaps to be filled in by focused household survey collection. This will enable continuous, accurate, and precise modeling of health trends at local and regional levels, efficiently optimizing field-level resources for population health monitoring and management.

1

Comprehensive baseline data will enable the detection of aberrations that indicate heightened risk of epidemics. High-resolution community context will enable highly targeted, rapid response to epidemics and natural disasters; instant sharing of data among decision-makers and with frontline workers will facilitate coordination during complex crises.

2

Basic civil registration and vital statistics (CRVS) collection will be faster, cheaper, and more accurate because field-level users will continuously update information, and the Atlas will in turn prioritize filling in data gaps, pushing requests to relevant users. (UNICEF’s Multiple Indicator Cluster Survey costs roughly USD 750,000 per survey on average, with considerable variation; USAID’s Demographic and Health Surveys, which rely on a private contractor, cost USD 1.1 to 9.7 million. Both surveys are infrequent, but are intended to be nationally representative.)

3

The Atlas platform will support the growth of third-party vendors, especially those who provide independent verification services for program impact claims, increasing public and private investor confidence in public health and healthcare delivery systems.
USE CASE

EPIDEMIC SURVEILLANCE & RESPONSE
Atlas detects a significant uptick aberration in local mortality patterns compared to high-resolution baseline information built up over time. Satellite scans of the high-risk area and collateral field reports cross-validate an increase in population movements and demographic shifts that necessitate a rapid field investigation.

Atlas simultaneously pushes the insight to World Health Organization (WHO) officials, ministry officials, and frontline workers.

1. Nearby frontline workers are redirected from their catchment areas to provide additional data collection resources.
2. Regional WHO officials send teams to bolster limited diagnostic resources. Government and international institutions remain alert.

A potential epidemic outbreak appears at urban and peri-urban clinics.

1. Atlas analyzes field-level and spatial information to infer likely dissemination patterns and movement of patients between rural households and areas with concentrated medical resources.
2. Atlas pushes social information requests to its user base. Atlas integrates responses to hone predictive mapping further based on social networks and to identify priority individuals within social networks for screening.
Based on social network data that has been steadily accruing through end-user interactions, Atlas generates provisional contact tracing maps that frontline and epidemic-response workers use to guide their investigations. Combined with verified case information, Atlas alerts frontline workers that a patient, household or region is at elevated, urgent risk and marshals resources accordingly.

Centralized information, updated in real time and integrated with geographic and social risk mapping enables systematic coordination across geographic areas. Targeted interventions result in rapid, efficient response.
TEAM & CULTURE

Our team reflects a unique cultural focus on marrying effective user-experience (UX) design with cutting-edge techniques in machine learning and computer vision. Applying an intensive, lean UX and customer-development roadmap, initially we will ensure that product development resources are used at high-yield by focusing on the use cases, local constraints, and strong unmet needs of stakeholders within Ministries of Health, our public financing partners, and community members. This will primarily be done through an already field-tested mix of user-research and rapid-prototyping techniques borrowed from our advisors and partners at leading Silicon Valley research and development shops such as Twitter, Intel Labs and Google X.

Within 60 days of our team kick-off, we expect to have a clear user-validated and field-tested rapid prototype of the total platform encompassing wireframes, storyboards, and a working data architecture and epidemiological response schema. With a strong product perspective and platform strategy in place, we will begin development of the backend remote-sensing, epidemiological modeling platform and the mobile clients. Partnering with leaders in open-source frameworks and scale-on-demand data systems, Atlas will undergo weekly cycles of rapid development, user testing, and increasingly rigorous field testing in our Ethiopian or Liberian pilot sites. We expect platform development and testing to take 90 days to arrive at a pilot-ready minimum viable product (MVP). Following a rapid launch into the MVP, we will run a further iterative development through a 90-day field pilot driving user testing and debugging. We have strong confidence that by the close of the first nine months of work we will have Atlas at full field-readiness with on-demand scalability in our cloud architecture to enable mass distribution and crisis response.

GOING TO SCALE

While we are focusing our lean product development efforts during this rapid pilot in a handful of test sites in sub-Saharan Africa, we recognize a massive opportunity to scale Atlas globally to address a broader and more intrinsic set of public health problems. Aiding this distribution, our team has strong relationships with Ministries of Health and frontline-worker organizations. We see our total available market reach as the 15 nations across Sub-Saharan Africa, Southeast Asia and Latin-America developing large scale frontline worker initiatives through public financing and private sector collaborations. We will initially pilot Atlas in Ethiopia and/or Liberia using seed funding sources (e.g., angels, foundations), and will focus on scalability in V2.0 through public sector financing programs, as well as private sector impact investing opportunities.
THE TEAM

PRABHJOT SINGH, MD, PHD
Director of the Arnhold Institute for Global Health, Special Advisor for the UN Health Equity Atlas

- One Million Community Health Worker Campaign
- Community Health System scalability expert
- Vice Chairman of Medicine, Population Health

JAMES H. FAGHMOUS, PHD
Chief Technology Officer

- Spatiotemporal data science expert
- National Science Foundation supported research

BRUNO SILVA, MFA
Lead Experience and Product Designer

- Amplify, Lead Experience & Senior Product Designer
- @Radical.Media & MTV, Designer

PATRICK DOUPE, PHD
Senior Data Analyst.

- Deep Learning and Statistics Expert
- Insight Data Science, Postdam Institute for Climate Impact Research (PIK), ANU Center for Climate Economics and Policy

EMILE BRUZELIUS
Epidemiologist

MATHEW LE
Software Developer

- Full Stack software engineer
- Expertise in spatial data management and visualization
OUR PARTNERS

USAID
FROM THE AMERICAN PEOPLE

Office of the UN Secretary-General's Special Envoy for Health in Agenda 2030 and for Malaria

DigitalGlobe

Dimagi

Medic Mobile

CommCare