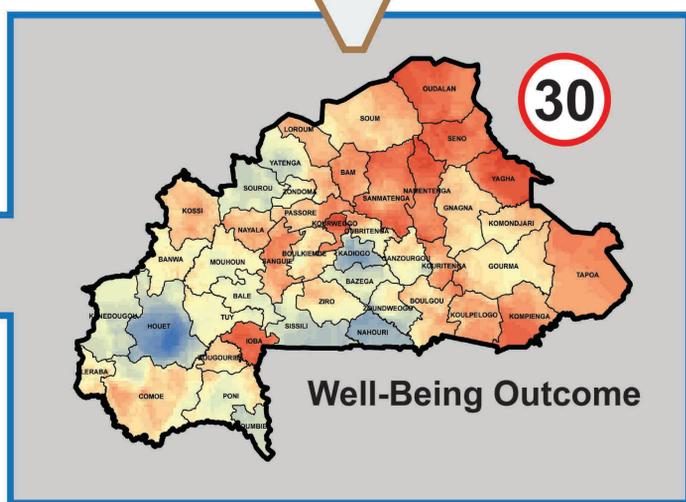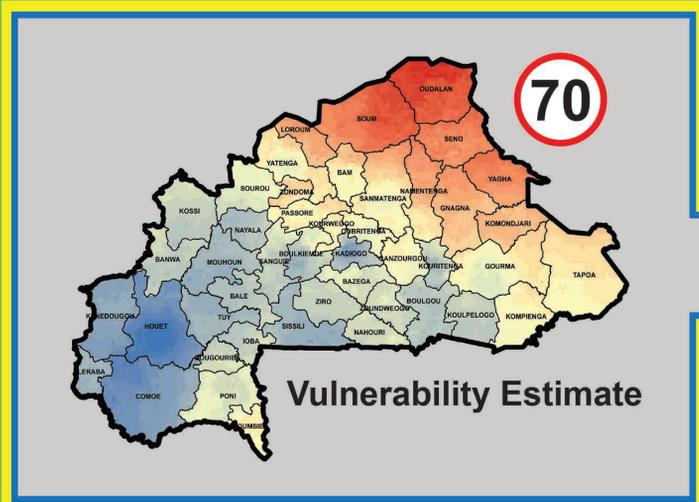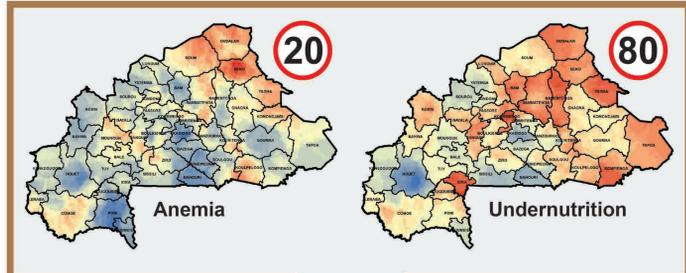# Structural Vulnerability Map of Burkina Faso - Feb. 2015
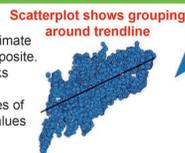
Definition of Structural Vulnerability:

Structural vulnerability is a tendency to be in a state of high-risk to negative well-being outcomes(ie. undernutrition, anemia) on account of persistent exposure to various potential shocks (ie. climatic, price) in combination with a chronic resilience deficit (ie. lack of absorptive, adaptive and transformative capacities).

Purpose of Map:

The purpose of the final vulnerability map is to better identify "hotspots" of structural vulnerability in order to better geographically target longer term resilience investments (development adapted to vulnerable contexts) where the need is greatest. Improved geographic targetting of the most vulnerable is critical to decision making regarding strategic investments for resilience and redressal of social justice related grievances which may lead to conflict.

Basic Methodology:

Big data analytics were leveraged to identify structurally vulnerable zones. These zones of development need were calculated by averaging together all relevant and available sub-national development indicators across a broad spectrum. In all, 36 datasets, many of which were historical, were aggregated into composites, which were then aggregated into higher level composites. Geographic areas where most development indicators were negative are more red and areas where indicators were relatively better are more blue.

Basic data processing steps are listed below:

1) Identify most relevant sub-national indicators available for the analysis.
2) Convert each geographic dataset to raster format. Use Kriging interpolation in the case of point data.
3) Winsorize data where appropriate based on histogram analysis. This prevents the data from being skewed by outlier data and amplifies geographic variation.
4) Rescale all datasets to a common 0-100 scale so that they are comparable for averaging to create composites.
5) Average datasets using weighting based on consensual subject matter expert judgement to create composites.

Anemia 20   **Undernutrition** 80

Vulnerability Estimate 70 + **Well-Being Outcome** 30

Final Vulnerability Map

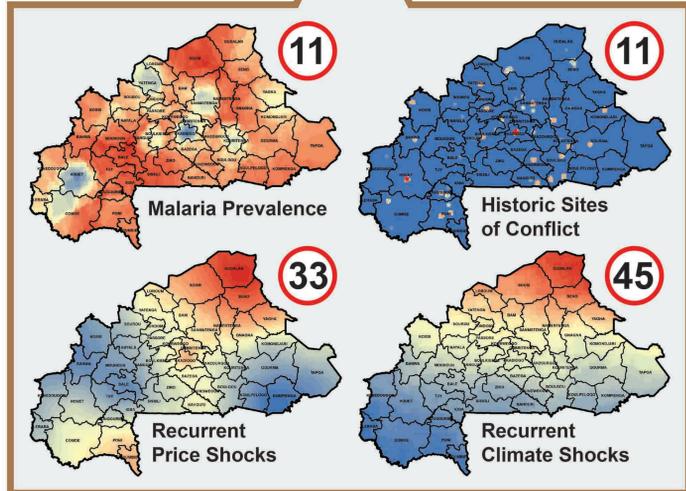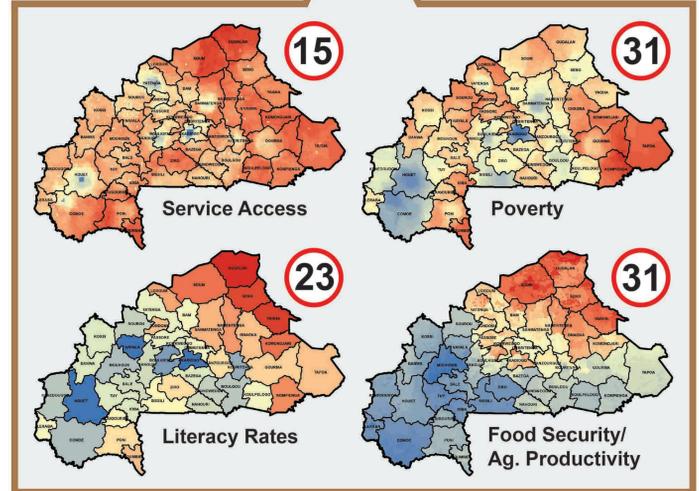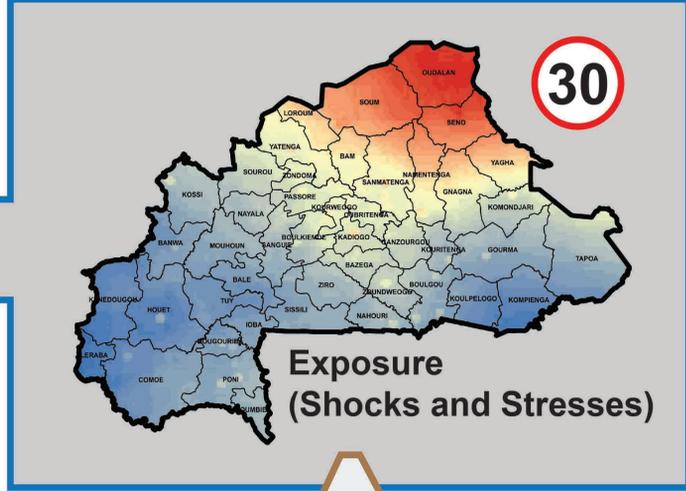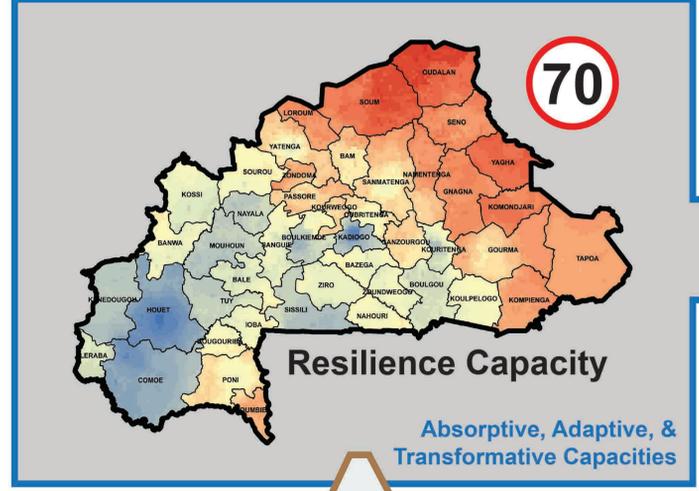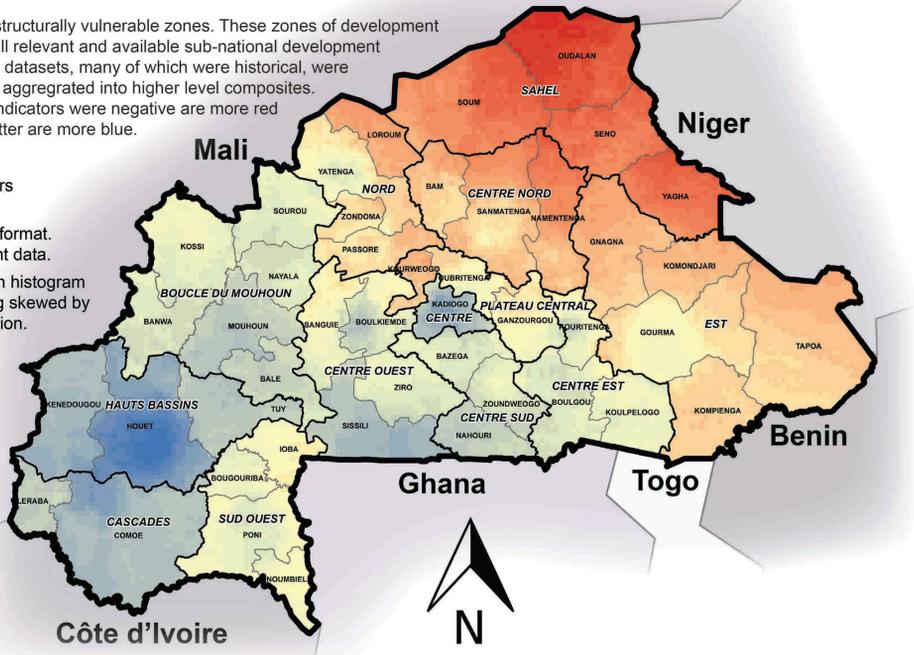Mali · Niger · Benin · Togo · Ghana · Côte d'Ivoire

Linear Regression Analysis:

A linear regression was run to determine how well the Vulnerability Estimate composite model predicts (correlates to) the Well-Being Outcome composite. The assumption is that if Resilience Capacities and Exposure to Shocks and Stresses are combined to form a Vulnerability Estimate, the vulnerable zones identified therein should correlate to geographic zones of negative well-being outcomes (ie. undernutrition). Modeled grid cell values from both geographic models were used for the regression analysis.

R-Squared = 0.39

Scatterplot shows grouping around trendline

Vulnerability Estimate (left) gets "corrected" here by averaging it with real well-being outcome measurements through the well-being composite above. The result of this correction is the Final Vulnerability Map to the right.

Resilience Capacity 70 + **Exposure (Shocks and Stresses)** 30

Absorptive, Adaptive, & Transformative Capacities

Service Access 15   **Poverty** 31
Literacy Rates 23   **Food Security/ Ag. Productivity** 31

Malaria Prevalence 11   **Historic Sites of Conflict** 11
Recurrent Price Shocks 33   **Recurrent Climate Shocks** 45

Legend:

how to read this infographic

1) Red Zones on all maps are most vulnerable and the blue zones represent least vulnerable relatively.

2) Boxes with blue border contain composite index maps. The + sign between composite maps signifies that they are averaged together to form yet another composite map. Follow the arrow symbol with = sign to see which composite they create when averaged together.

3) Boxes with brown border contain sub-composite index maps. All subcomposite maps in brown bordered boxes are averaged together to form the composite maps they feed into (see the tip of brown box with = sign in it). It should be noted here that subcomposite maps in this infographic are based on other component maps not visualized on this infographic. The table at right gives the specifics about datasets used and the nature of the components maps that were aggregated using a weighted average to produce the subcomposite maps you see in this infographic.

6) Numbers in red circles represent relative weighting of each composite or subcomposite as it contributes to the average. Weightings are represented as a percentage out of 100%. The reason that some of the weightings are odd numbers is because they were derived from an initial intuitive weighting based on double-weighting, half-weighting, one and a half weighting etc., based on a group consensus of subject matter experts. These informal weightings were then converted to a percentage of 100 to calculating weighted averages to form composites.

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Top 50 Most Vulnerable Communes

Rank	Department	Province	Region	Vulnerability Score	POP (2006 Census)
1	TIN-AKOFF	Oudalan	SAHEL	96.3	21,013
2	DJCU	Oudalan	SAHEL	95.5	25,321
3	OURSI	Oudalan	SAHEL	91.9	15,806
4	GOROM-GOROM	Oudalan	SAHEL	88.8	108,346
5	MARKOYE	Oudalan	SAHEL	88.5	27,478
6	KOUTOUGOU	Soum	SAHEL	88.4	18,655
7	TITABE	Yagha	SAHEL	87.5	20,639
8	FALAGOUNTOU	Seno	SAHEL	85.5	18,180
9	TANKOUGOUNADIE	Yagha	SAHEL	85.2	16,453
10	ARBINDA	Soum	SAHEL	84.5	91,020
11	SEBBA	Yagha	SAHEL	84.1	32,374
12	BOUNDORE	Yagha	SAHEL	83.9	22,773
13	GORGADJI	Seno	SAHEL	83.7	29,913
14	DORI	Seno	SAHEL	82.6	106,808
15	SEYTENGA	Seno	SAHEL	82.2	31,585
16	BOUROUM	Namentenga	CENTRE NORD	81.6	46,232
17	SOLHAN	Yagha	SAHEL	81.1	25,168
18	NAGBINGOU	Namentenga	CENTRE NORD	80.9	16,004
19	SAMPEGA	Seno	SAHEL	80.6	19,227
20	TONGOMAYEL	Soum	SAHEL	80.2	70,372
21	MANSILA	Yagha	SAHEL	80.1	20,165
22	PENSA	Sanmatenga	CENTRE NORD	77.3	36,158
23	DJIBO	Soum	SAHEL	76.3	60,042
24	BARLO	Sanmatenga	CENTRE NORD	76.2	20,707
25	DISGULI	Soum	SAHEL	75.0	8,989
26	TOUGOURI	Namentenga	CENTRE NORD	74.4	76,824
27	SOLLE	Loroum	NORD	72.8	17,526
28	BARABOULE	Soum	SAHEL	72.0	29,883
29	BANH	Loroum	NORD	70.8	30,332
30	COALLA	Gnagna	EST	70.8	42,652
31	MANI	Gnagna	EST	70.7	68,448
32	BOURZANGA	Bam	CENTRE NORD	69.8	47,751
33	BARSALOGHO	Sanmatenga	CENTRE NORD	69.6	78,933
34	OUINDIGUI	Loroum	NORD	69.4	28,278
35	PORT-MENSAO	Soum	SAHEL	69.3	24,052
36	TITAO	Loroum	NORD	69.2	66,717
37	NAMISSIGUIMA	Sanmatenga	CENTRE NORD	69.0	5,752
38	THION	Gnagna	EST	68.3	23,025
39	BOTTOU	Tapoa	EST	68.0	46,959
40	FOUTOURI	Komondjari	EST	67.7	14,683
41	BARTIEBOUGOU	Komondjari	EST	67.5	16,067
42	TORGHIN	Kourweogo	PLATEAU CENTRAL	67.4	16,500
43	BOGANDE	Gnagna	EST	66.7	84,838
44	LIPTOUGOU	Gnagna	EST	66.5	41,823
45	NIOU	Kourweogo	PLATEAU CENTRAL	66.2	26,998
50	ZEGUEDEGUEN	Namentenga	CENTRE NORD	66.0	21,904

All datasets used for composites (datasets averaged based on weightings listed):

* datasets averaged based on weightings listed
* historical datasets used when available in order to map structural vulnerability vs. conjunctural
* all time series datasets have been averaged over entire period to map tendency (structural issues)

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