

# Climate, Conflict and Poverty in Ethiopia

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# Climate change, poverty, and conflict is a triple-threat in developing nations

- Number of people suffering from climate change, poverty, and conflict simultaneously is **increasing**
- Research shows a link between weather and war (rising global temperatures leading to humanitarian conflict)
- War also hits the poor the hardest



*Source: Las Vegas Review Journal*



*Source: TIME magazine*

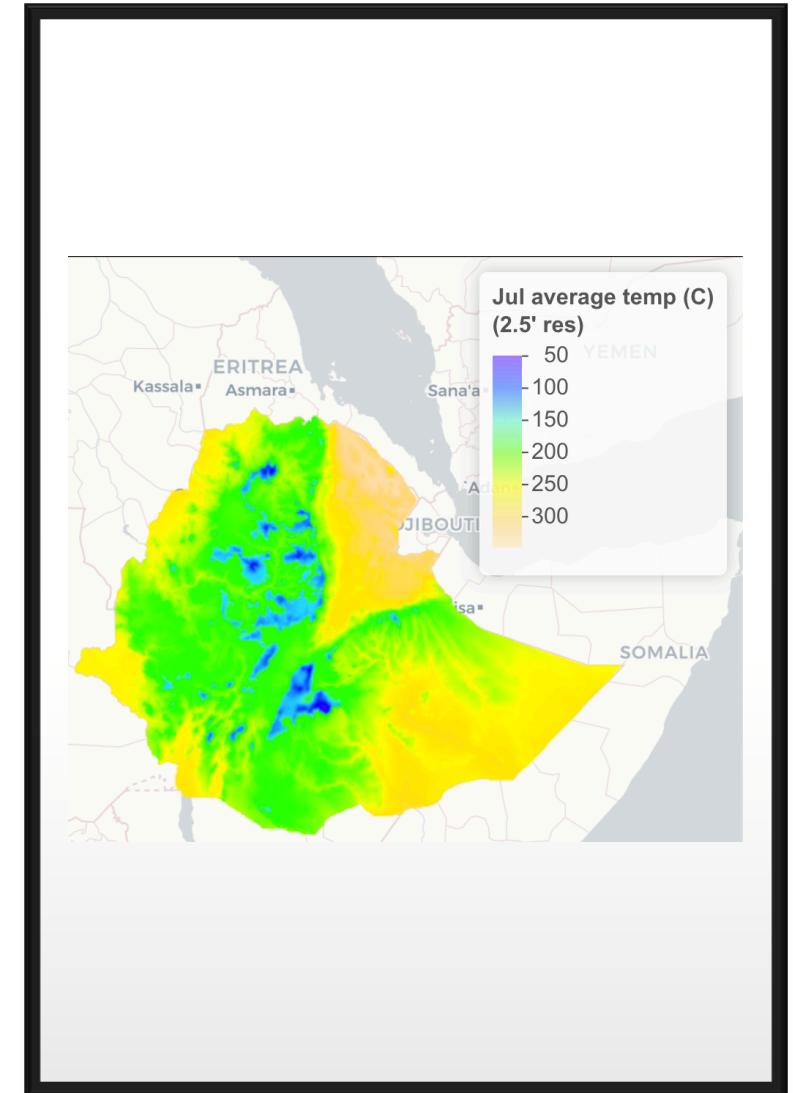
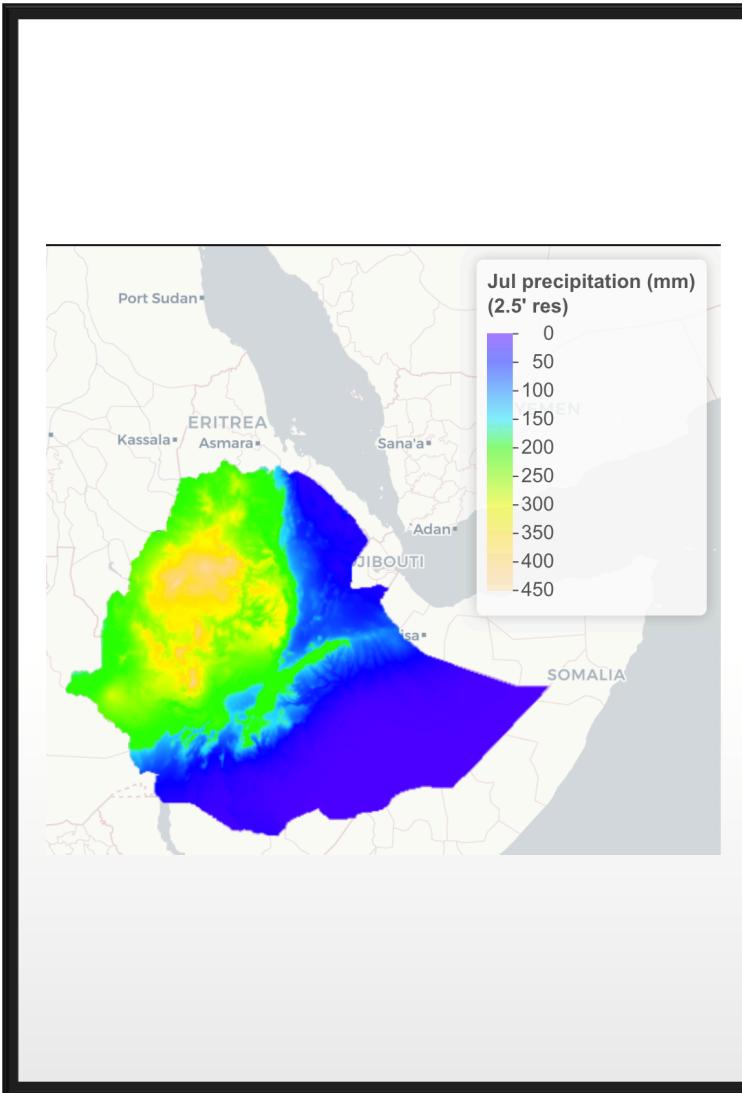
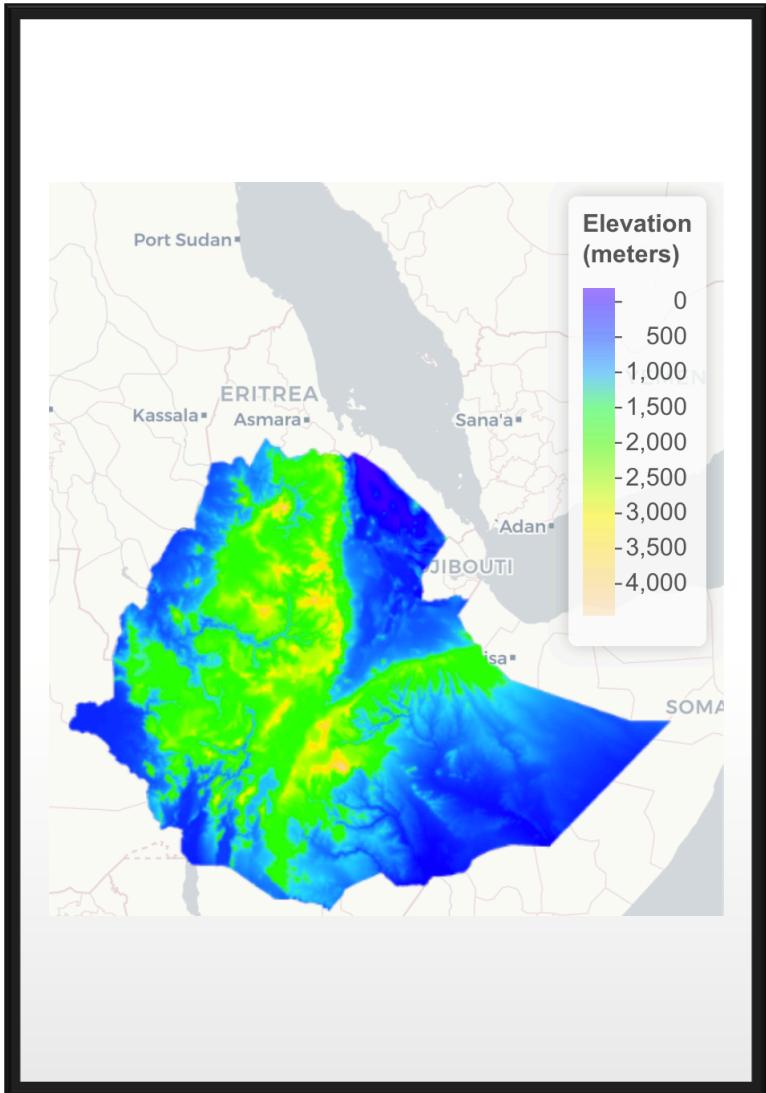
Research question: Which populations  
are suffering from climate change,  
poverty, and conflict at the same time?

# Final output: A web map of Ethiopian districts that rank high on all three indices

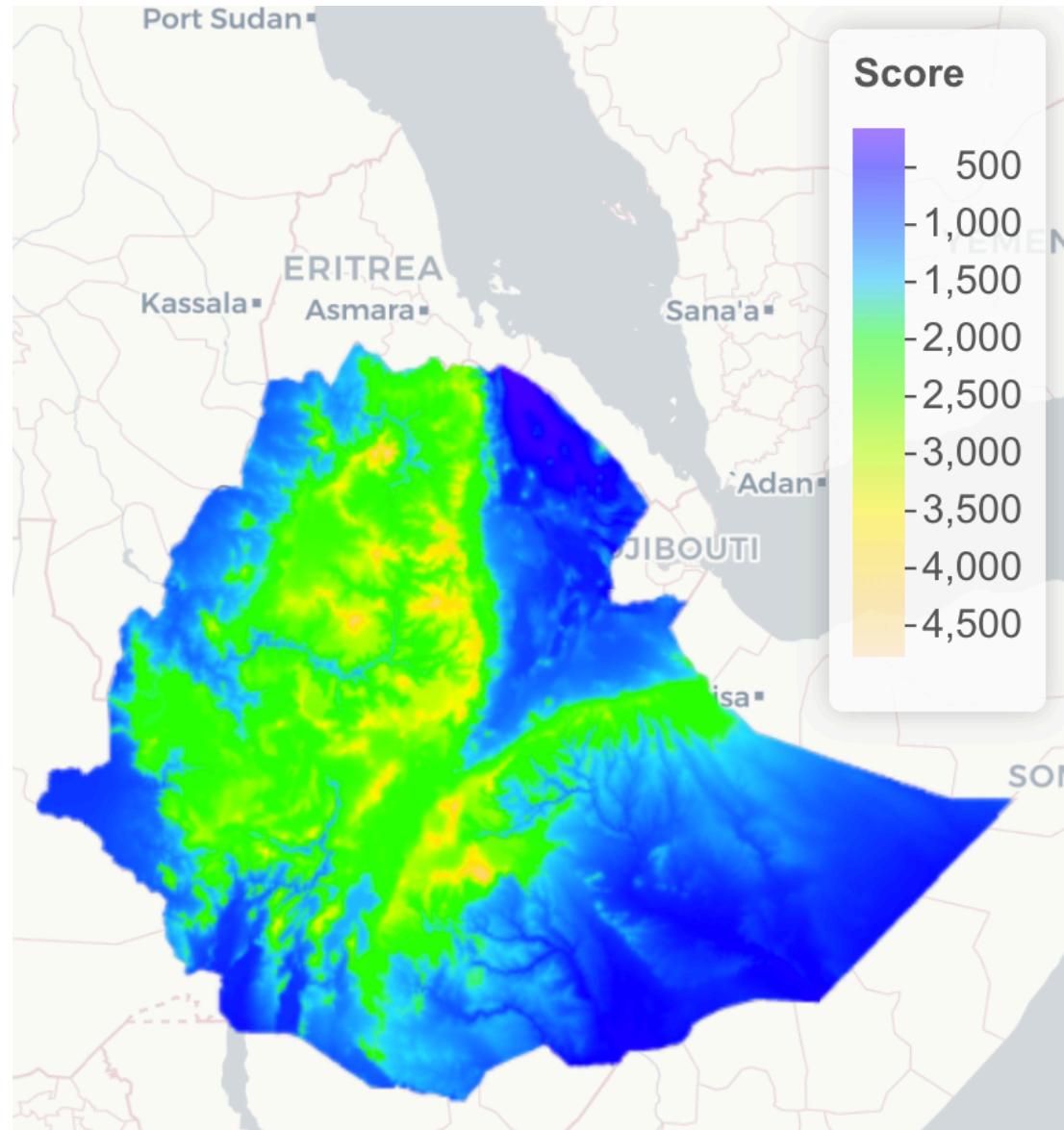
- Climate change severity (measured by a ‘Climate Vulnerability Index’)
- Poverty (measured by the Multidimensional Poverty Index)
- Conflict severity (measured by the number of fatalities per 100,000)

# I. Generating a type of climate vulnerability index using map algebra

- NASA STRM
  - Digital Elevation Model for Ethiopia, 2.5 m res
- World Climate data rasters ([worldclim.org](http://worldclim.org))
  - Precipitation (i.e. rainfall), 2.5 m, 1970-2000
  - Average temperature, 2.5 m, 1970-2000
  - Cropped and masked to ETH Adm o
- Formulaically combine rasters to generate an index
- Aggregate index to district level



Current formula: Weighted average of these three rasters (after cropping, masking and resampling rasters using bilinear interpolation to the lowest resolution raster which was elevation)





# Areas of feedback re: map algebra

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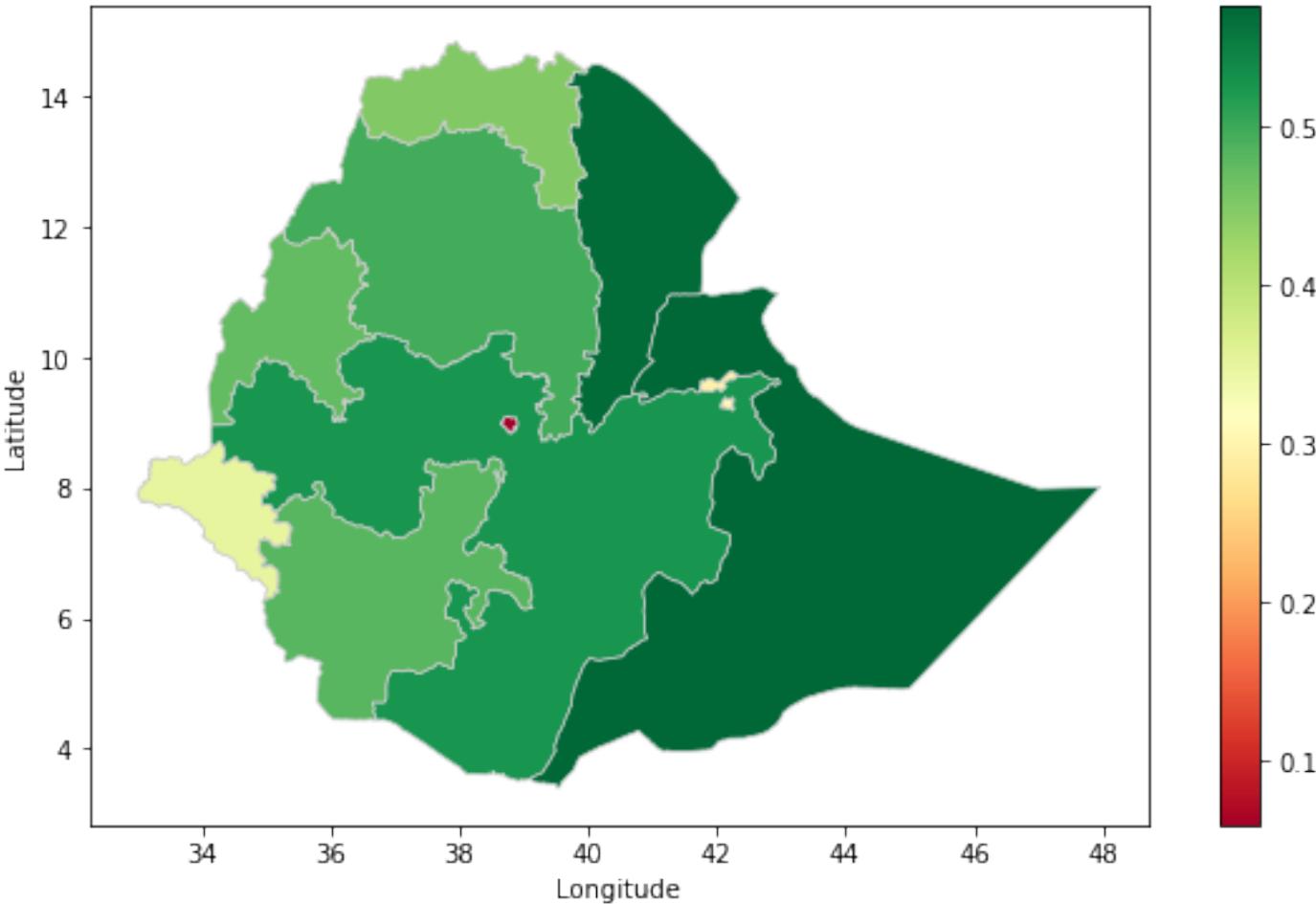
- Treating elevation in the formula (masking DEM raster to < 5 m., etc?)
- Formula itself: Weighted average formula vs. additive, multiplicative, logarithmic etc.?
- Will likely aggregate by mean index values at the district level

# I. Mapping district-level poverty to visually see trends

- University of Oxford Poverty and Human Development Initiative (OPHI) via Humanitarian Data Exchange ([data.humdata.org](http://data.humdata.org))
  - 2020 Multidimensional Poverty Index (MPI)

# We see higher poverty in climate-vulnerable districts

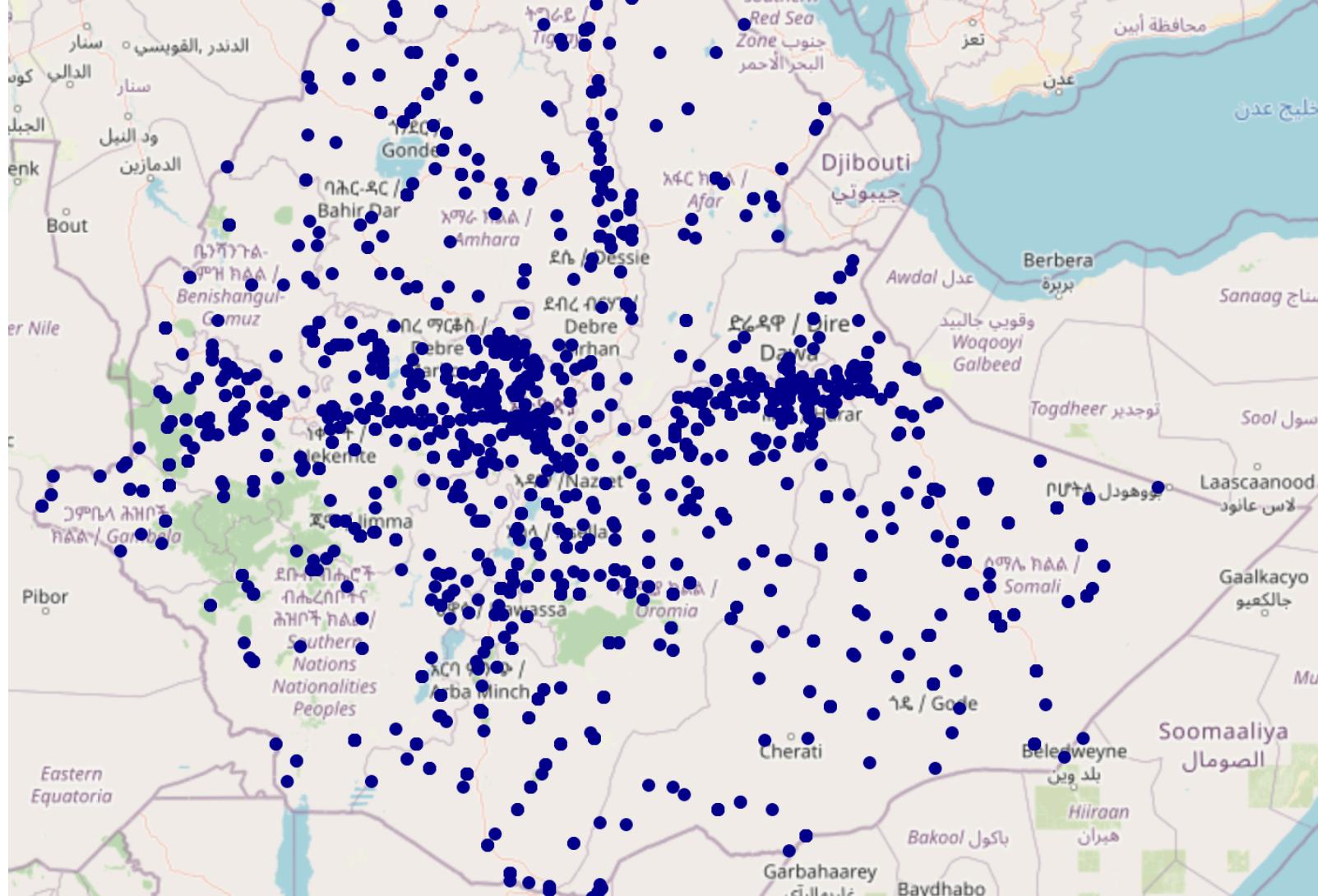
Ethiopia Multidimensional Poverty Index (higher values = higher poverty), 2020



- Higher poverty in eastern Somali district, where there is frequent catastrophic flooding each year
- Higher poverty in northern Afar district, where average temperatures are higher

# I. Mapping district-level conflict to visually see trends

- Armed Conflict Location Event Database (ACLED)
  - 5,636 observations of armed and non-armed political violence in Ethiopia from 1997-2020
  - Attribute of interest: number of fatalities per event
  - Time frame: 1997-2020



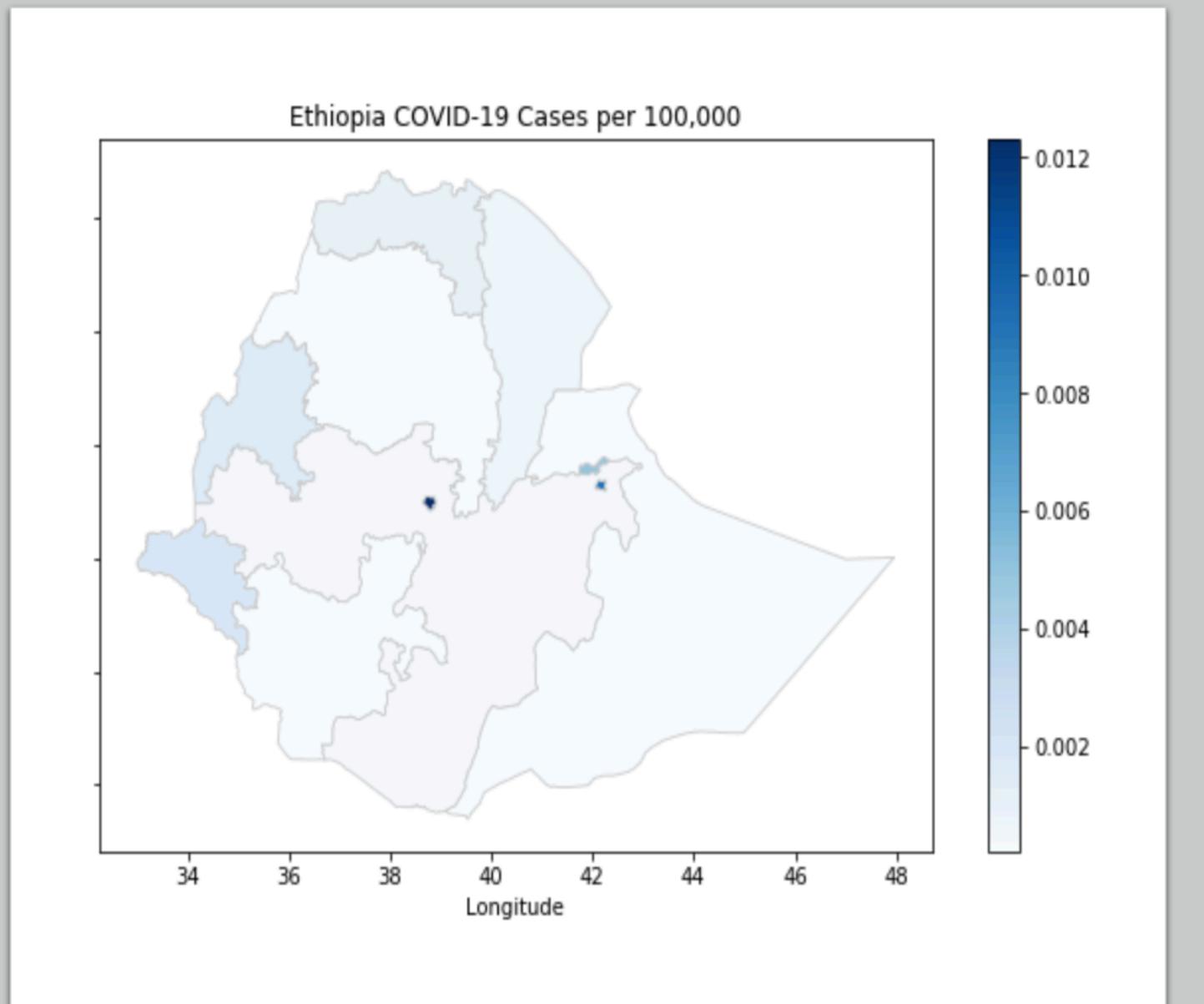
More conflict events in Addis Ababa, Dire Dawa, Harari and Oromia districts

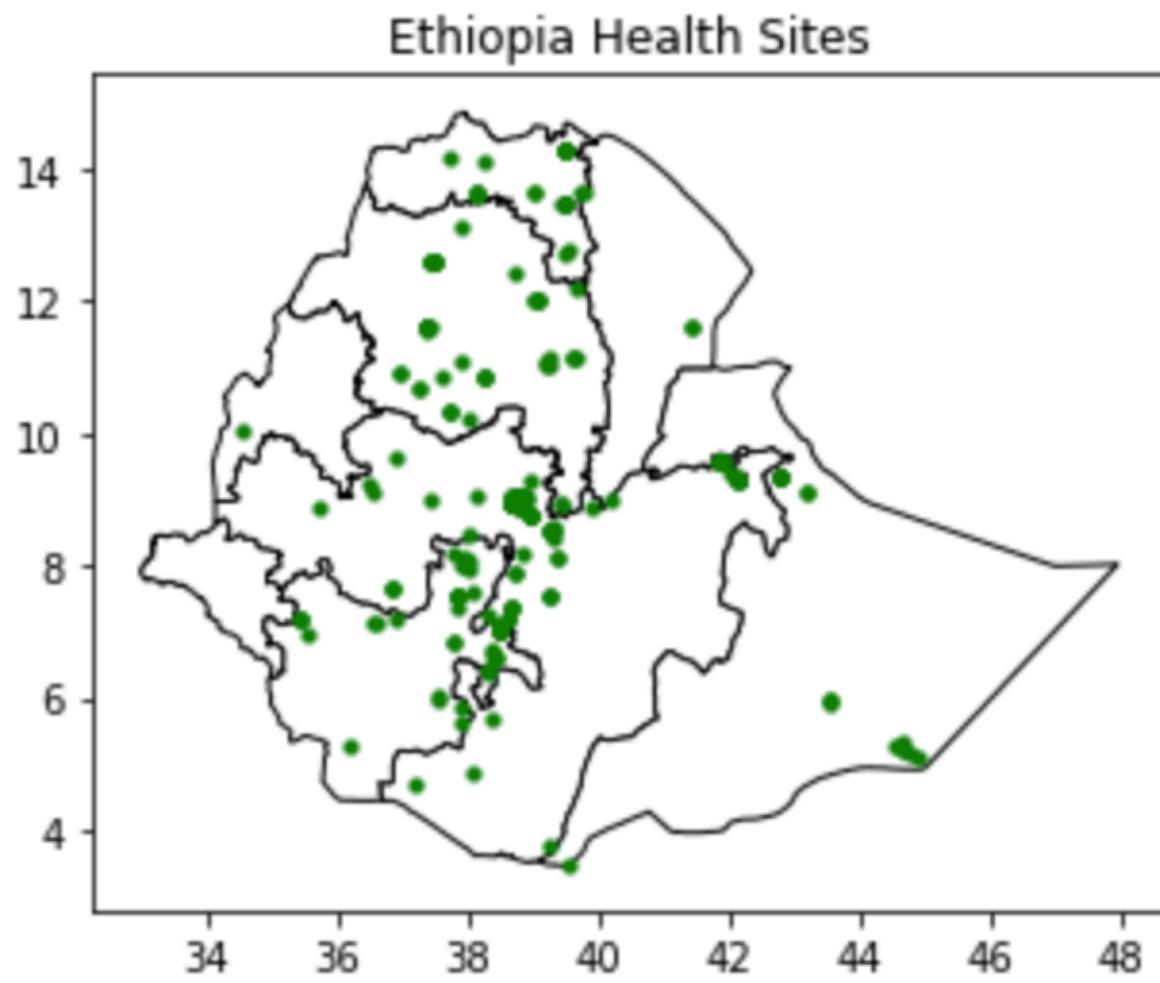
# Counting points in polygons to measure conflict severity

- Will calculate metrics ‘fatalities per 100,000 people’ by counting points in polygons
  - 5,636 observations of armed and non-armed conflict in ETH from 1997-2020
  - Count events in each ETH Adm 2 polygon, sum fatalities within polygon, divide by district population and multiply resulting value by 100,000

# COVID-19 cases per 100,000 (as of Oct 29, 2020)

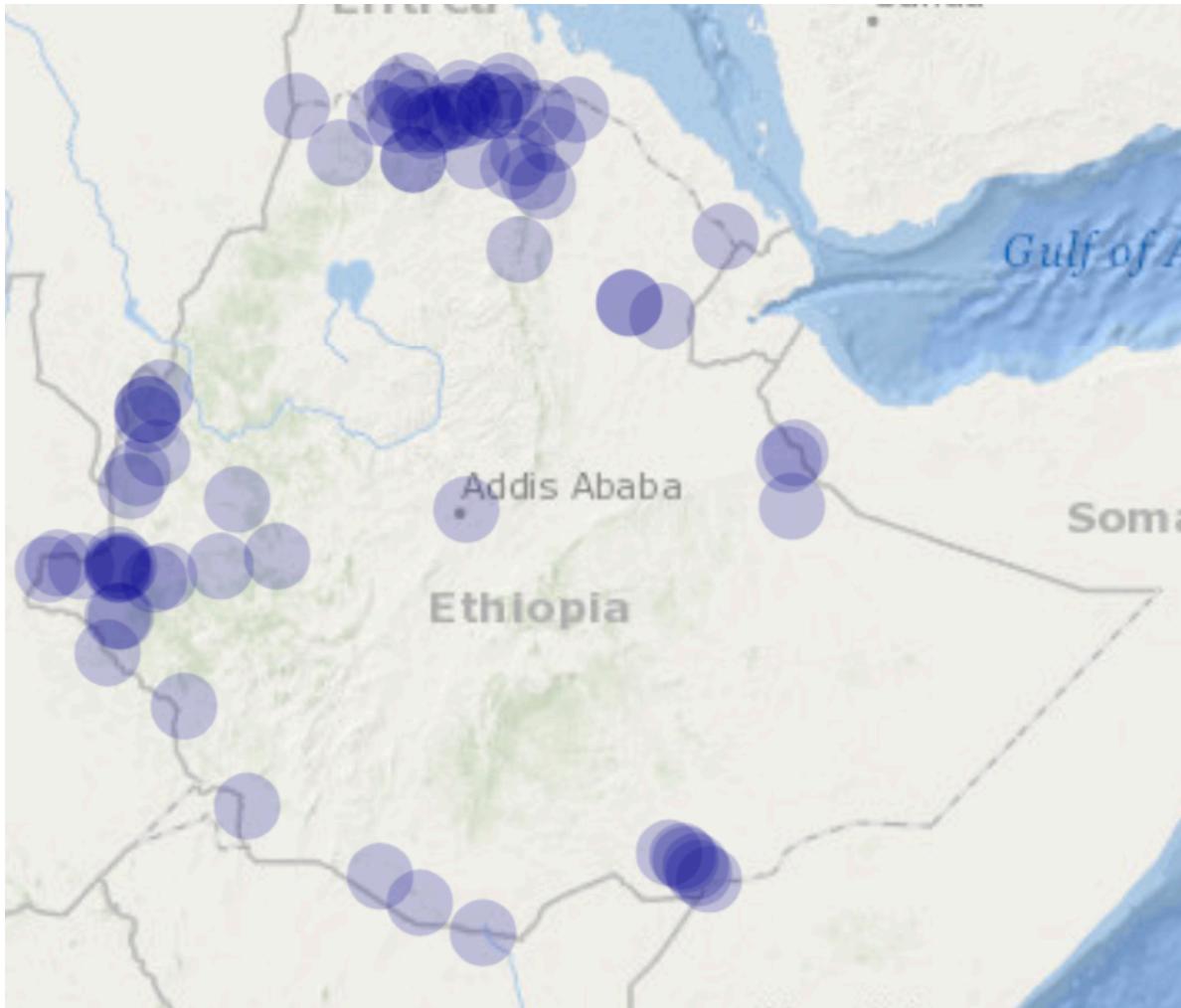
Source:  
Humanitarian  
Data Exchange,  
OCHA Ethiopia





Location of  
health sites,  
2020

Source:  
Humanitarian  
Data Exchange  
(HDX), OCHA  
Ethiopia



# Location of refugee camps, 2020

Source:  
Humanitarian  
Data Exchange,  
OCHA Ethiopia