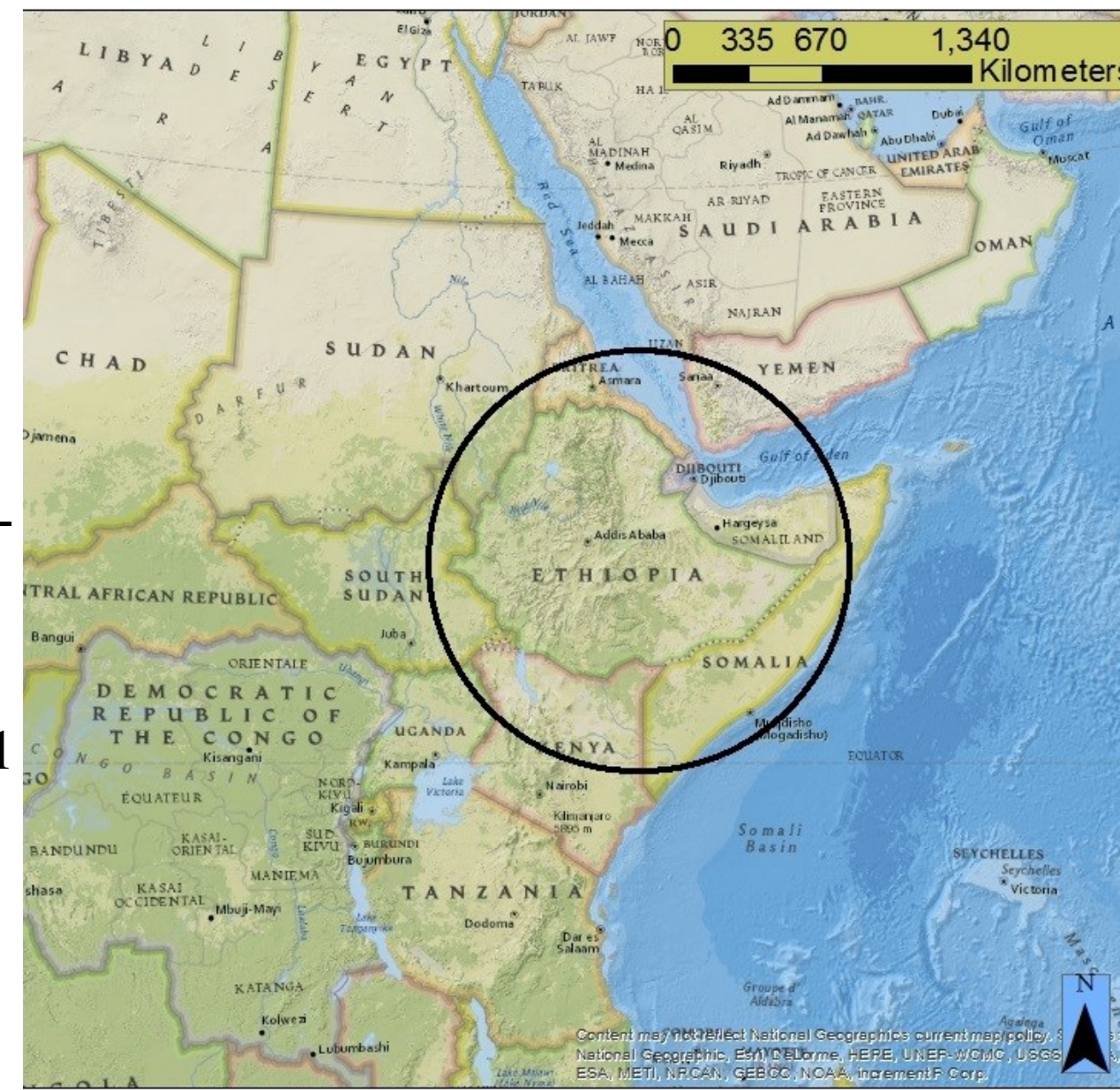


Access to Health Centers in Ethiopia

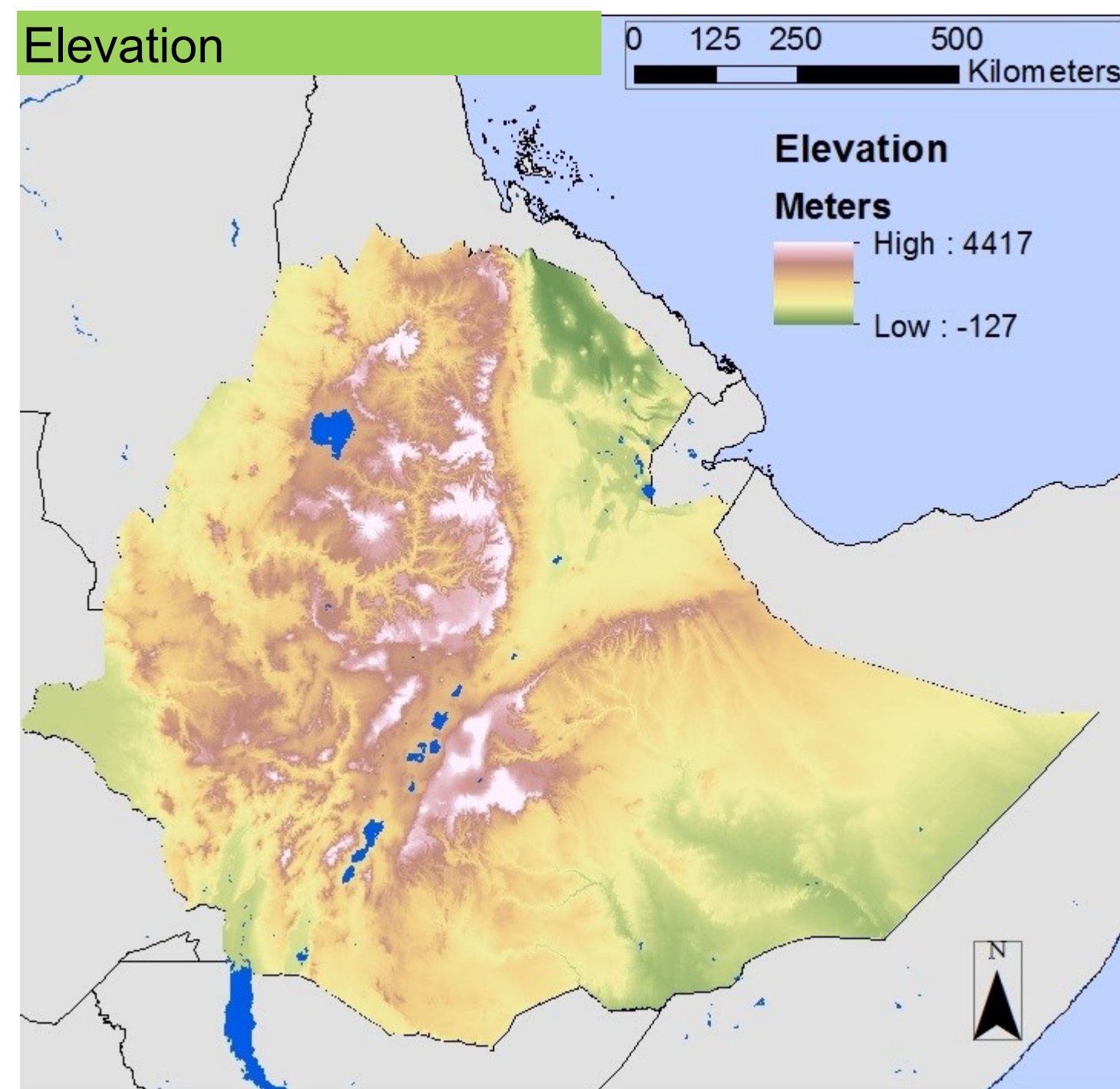
Background

Poor nutritional status of women and children has been a persistent problem across Ethiopia. Despite recent improvements in the rates of stunting and underweight, the current prevalence is estimated to be 44% and 29%, respectively. These forms of undernutrition negatively affect human development at individual and societal levels. 165 million children are stunted worldwide and undernutrition is at the root of 3.1 million deaths of children under 5 years of age. Evidence suggests investment in improving nutrition during early childhood is a long-term driver of economic growth.



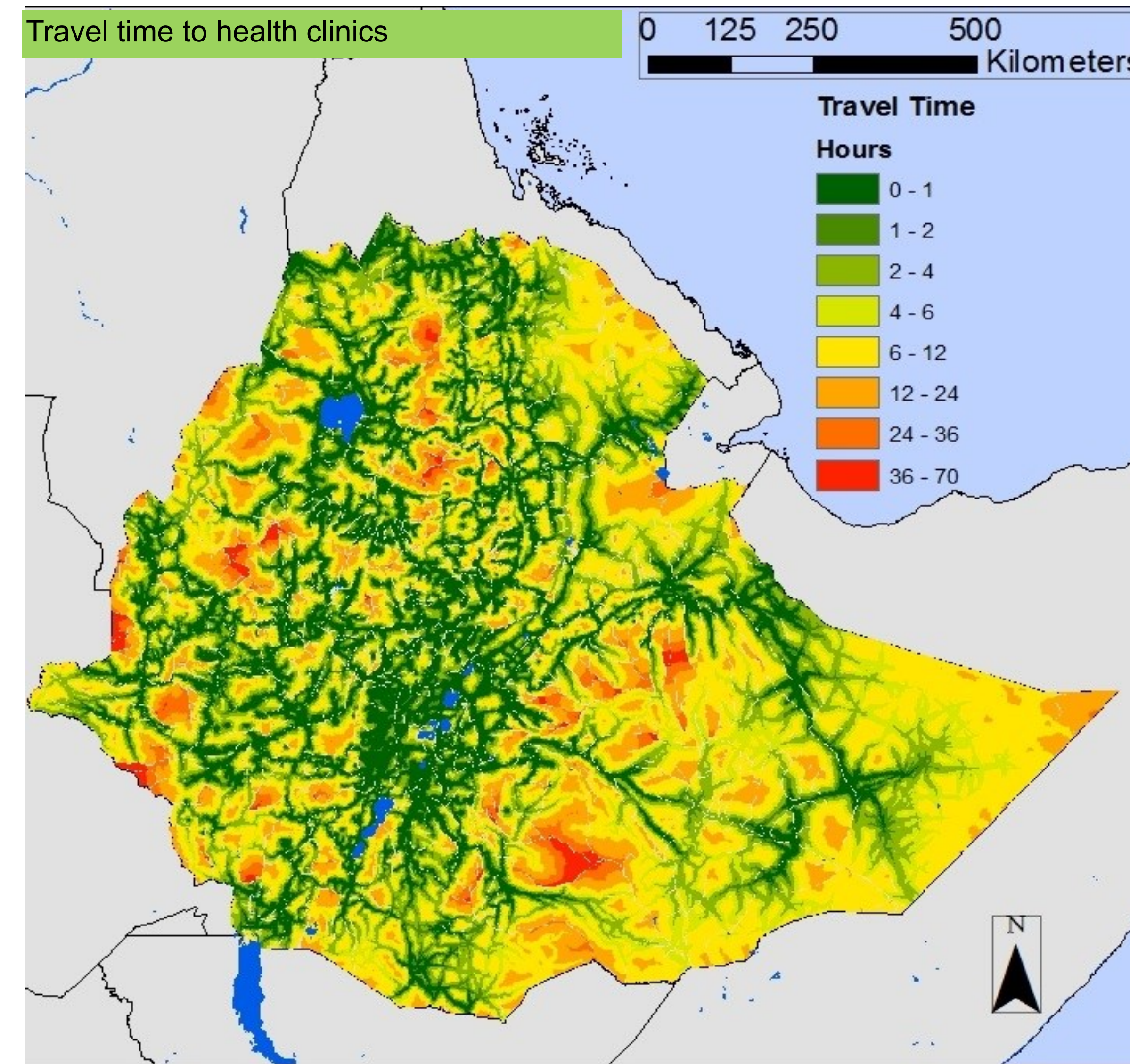
USAID funds nutrition sensitive and nutrition specific interventions in Ethiopia aimed at improving key health and nutrition indicators within the country. The nutrition specific interventions are run by the government and implemented through health centers. Access to these health centers could be a barrier to participation in nutrition programs or affecting child nutritional status. A study was conducted in 2012 examining distance to health centers and its effect on child mortality and found distance to a health center had an impact on children under five mortality in poor, rural, and remote areas of Ethiopia. Does most of the population have access to these health centers or is physical access a real constraint and barrier to participation for certain populations? Understanding how accessible health centers are across Ethiopia can help the Ethiopian government and various Non-governmental organizations (NGO's) better design and target future interventions.

Methods

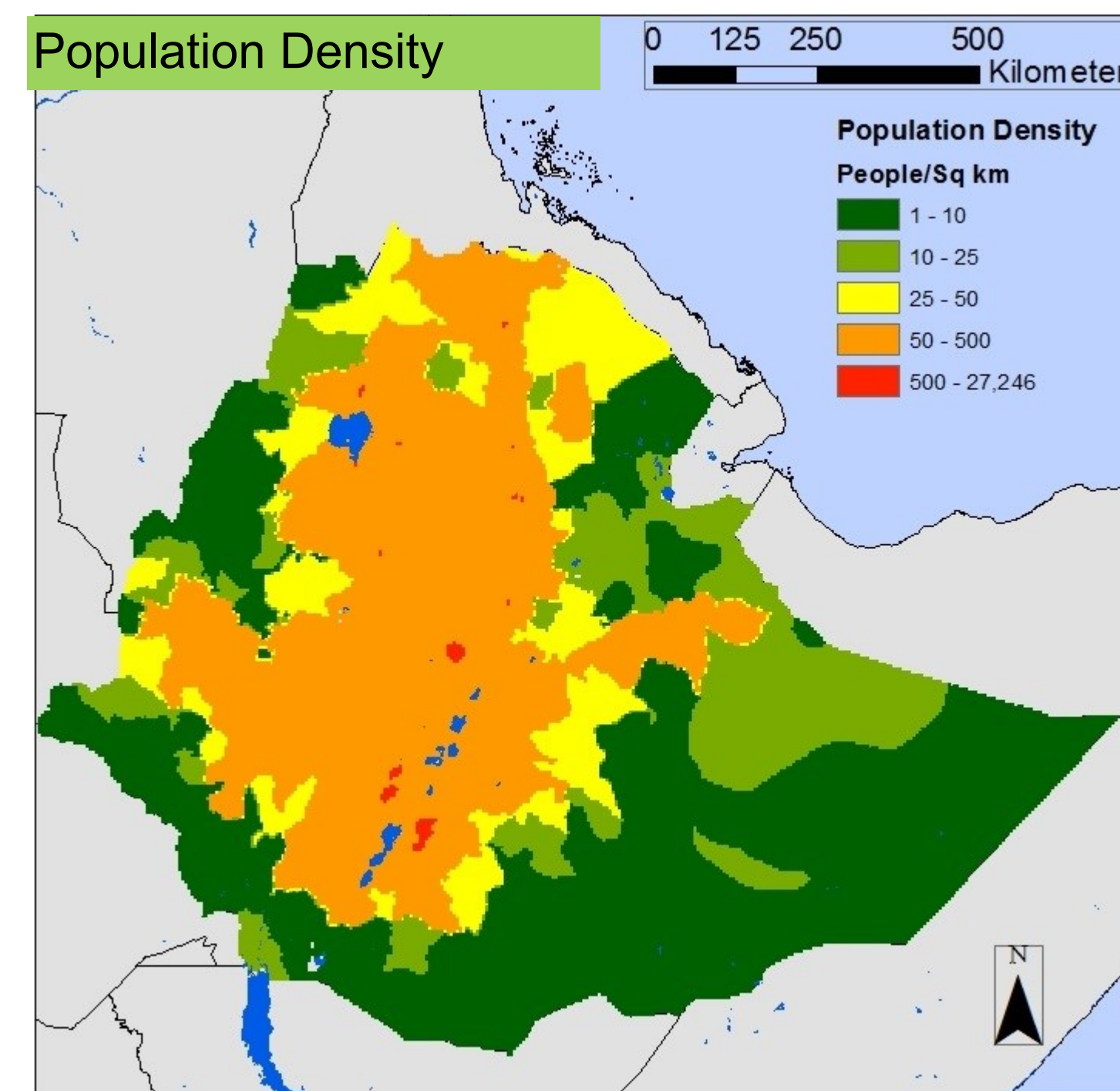


Access was approached as a least cost problem. It was assumed populations would take the least cost way to health centers and this was measured as travel time. Travel times were assigned to types of roads, land cover, rivers, and borders. Two assumptions were made when assigning travel time: 1. Ethiopians would not cross the Ethiopian border to access health centers outside of the country, and 2. Rivers would not be crossed to access a health center, giving borders and rivers both a score of "0". Roads and land cover data were assigned travel times based on standardized speeds used by the World Food Program and the Food and Agriculture Organization for food security mapping. Slope, measured using a 30 arc second digital elevation model, was taken into account as an affect to land speed meaning as slope increased, speed decreased. Since Ethiopia is mountainous, slope was an important component of computing travel time. All of these data layers were then merged into a cost raster to represent the travel time, or least cost way, to the closest health center.

Findings



The travel time map indicates approximate travel time in hours to the nearest health center. It is easy to see that health centers near roads are those that are most accessible as those areas are covered in green and indicate the lowest travel time. However, this was obvious without creating a map and further information is needed to draw meaningful conclusions. Areas colored in yellow to red are most concerning since people in those areas have to travel anywhere from 6 to 70 hours to the closest health center. If a person is truly unwell, this time may increase or seem impossible. Populations without access to cars would have to walk and



if their illness made them unable to walk, traveling more than three days to a health center could mean death. Understanding these issues leads to the question: how many people live in the areas colored in yellow to red?

Population density was layered over the travel time map to represent access to health centers based on population. No areas of zero population were found. This data suggests that areas of higher elevation may be more population dense than most lowland areas. Further investigation is needed to determine if this finding is significant or not.

Conclusions and Recommendations

Most population dense areas have reasonable access to health centers. Areas of concern include those in red that are shaded dark since those areas indicate population dense areas that are up to 70 hours away from the nearest health center. The map below shows these areas are concentrated in rural lowland areas of Ethiopia. While population density appears to be concentrated in highland areas, those lowland areas that are population dense may not have good access to a health center. These areas should be evaluated to determine the most effective way of giving these populations access to health centers. Solutions may include additional health centers or infrastructure.

Limitations and Moving Forward

Data sources spanned from 2000 up to 2013 meaning health services and access could have improved or deteriorated since the data was collected. Populations could have shifted, roads been rehabilitated, or health centers built. Assigned travel speeds may not accurately reflect the time it takes to reach a health center. People may be able to travel much faster, on average, or much slower depending on the method they choose to reach the health center. Slope data is accurate up to 1 kilometer leaving a lot of room for error and this error would effect travel speed.

This model is limited to showing an estimation of what travel time may be for populations across Ethiopia. More steps would need to be taken to evaluate each population's real situation in order to decide on program changes or implementation. However, it offers program designers an opportunity to evaluate communities they are implementing programs in and consider which communities may be more vulnerable to health disparities based on their access to health clinics, as modeled by these data. The data suggest lowland populations may have less access to health centers than highland populations. More research on differences between lowland and highland populations would offer insight into what the data are suggesting.

