Strengthening malaria and climate research in Ethiopia

The project ”Ethiopian Malaria Prediction System” (2007 to 2013) combined new population-based malaria transmission information with climate and land use variability data to develop an early warning to predict malaria epidemics in Ethiopia.

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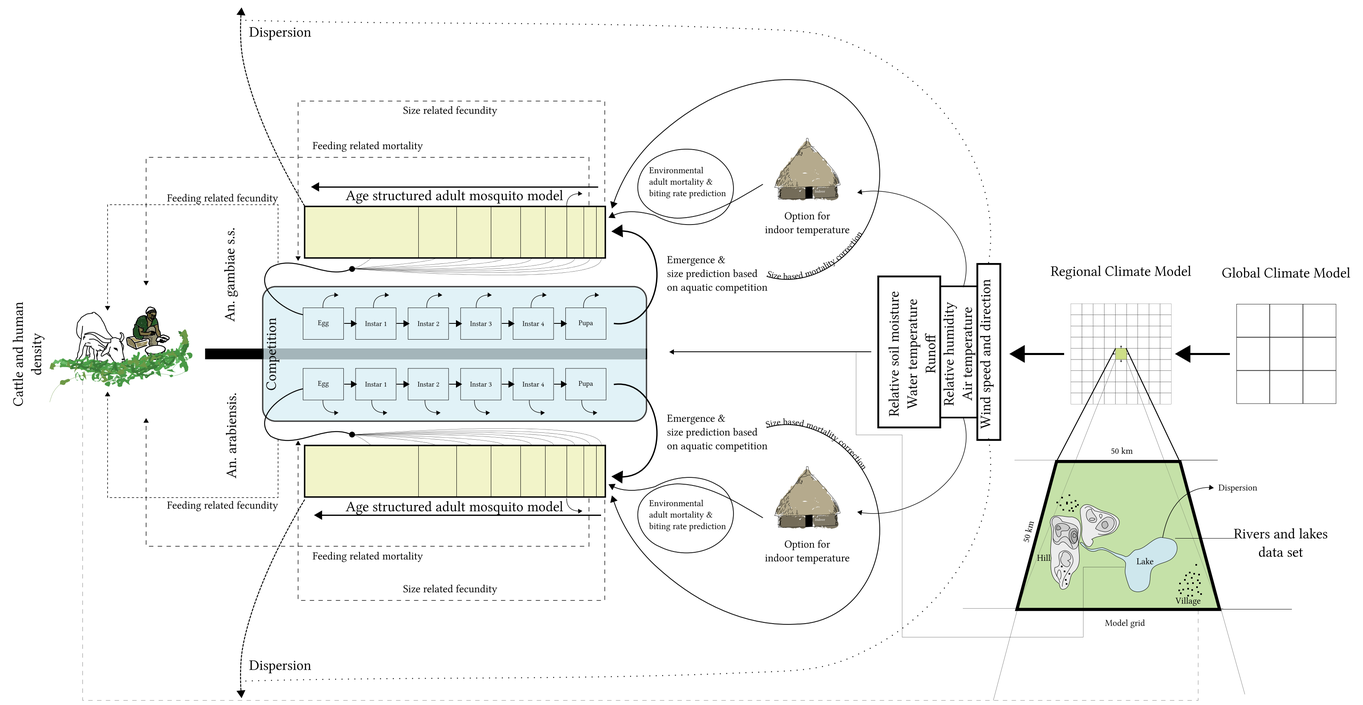
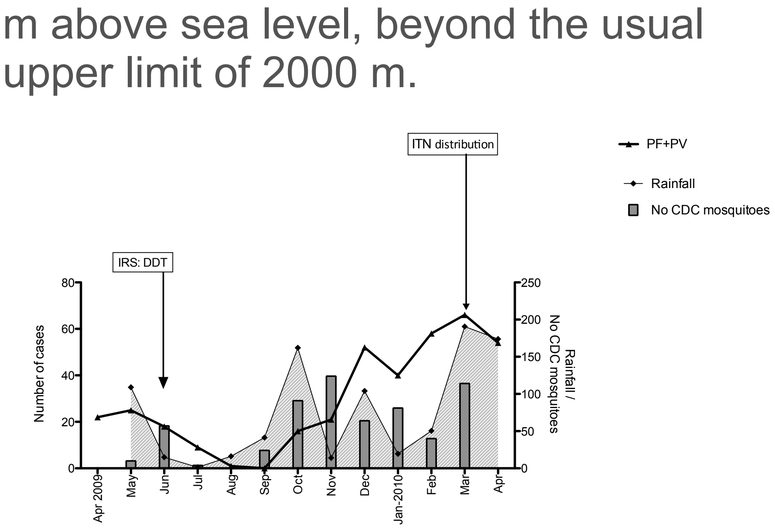


Although weather variability is the main driver of malaria in Ethiopia, the association between weather and malaria is complex. Statistical models can predict malaria for large areas, but, as malaria transmission varies and depends on local environmental conditions, we need to have good and local knowledge about each area.

Our research provided new information on the transport of moisture into the country. We developed a new classification of climate zones.

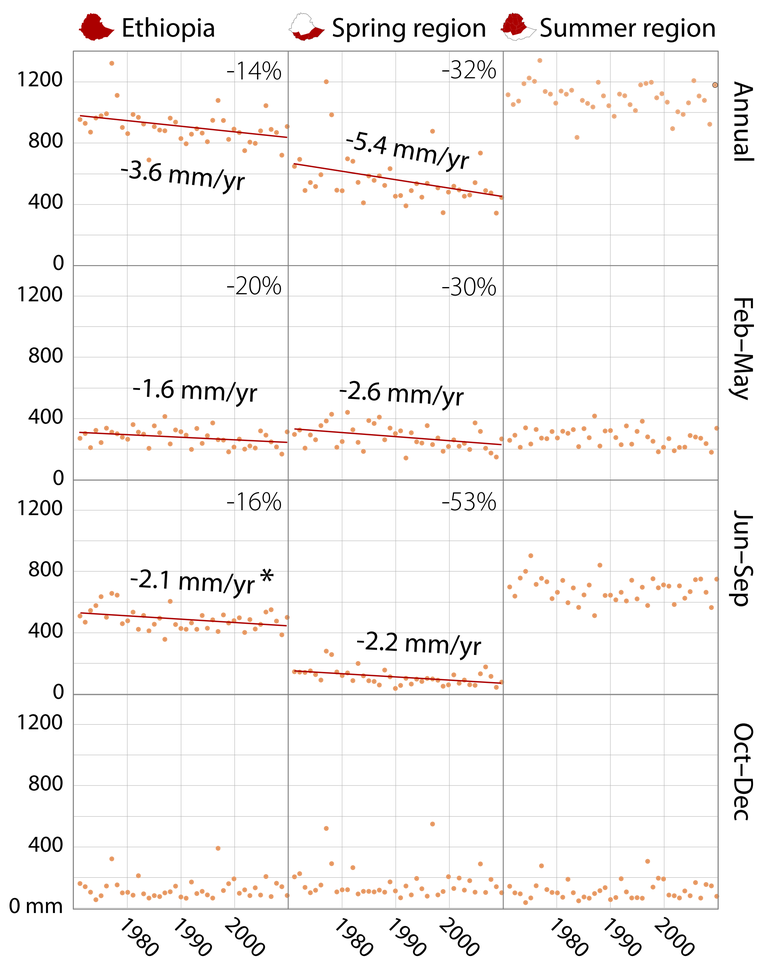
Hydrology studies show that potential climate change differs among the Ethiopian river basins, with river flows being sensitive to variations in rainfall, and less to temperature changes.

Epidemiological and entomological studies (figure below) from both high- and lowlands showed seasonal variation in malaria incidence and entomological inoculation rates (EIR), described the commonly occurring vectors, and measured insecticide resistance of *An. arabiensis* in some areas. Malaria transmission takes place up to 2300 m above sea level, beyond the usual upper limit of 2000 m.



Data from all meteorological stations shows that rainfall decreased in southeast Ethiopia (see figure below).

Global warming may lead to increased risk of malaria in highlands, and less in the lowlands with already high average temperatures.



The computer model (Open Malaria Warning; open source), incorporates hydrological, meteorological, mosquito-breeding, land-use data, and cattle densities to find out when and where outbreaks are likely to occur (Figure above).

We validated the model with data of malaria transmission in the highlands and lowlands of Ethiopia, and known distribution of An arabiensis and *An gambiae* in Africa (see maps below of Africa).

To improve such models, we need longterm monitoring of malaria cases and mosquito densities. Currently we also work on improving seasonal weather forecasting for smaller geographical areas.

Our research strengthened research capacity in Ethiopia (eight PhD studies and 20 master degrees), and provided new knowledge on weather forecasting, and on malaria transmission.

See malaria.b.uib.no/emaps for more details and publications