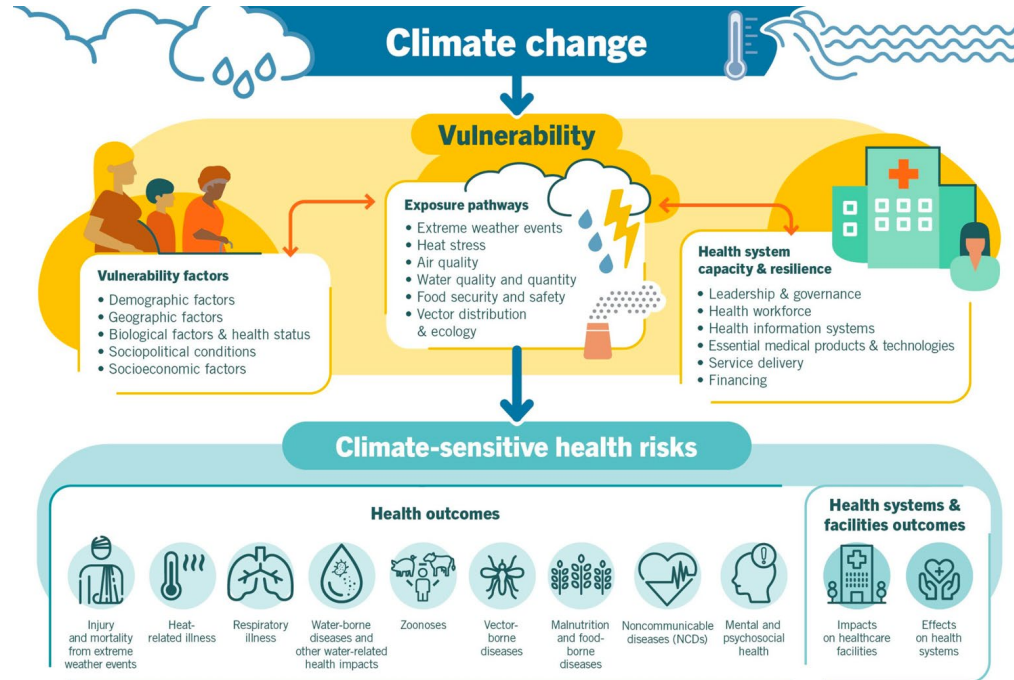


CHAP deep dive

From a single model in isolation to the full DHIS2
climate & health platform

WHO — climate change is the single biggest health threat (!)



A common modelling choice — Bayesian GLMM

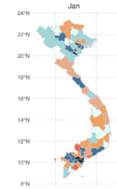
A common modelling choice:
Bayesian generalised linear mixed model (GLMM)



$$\log(\mu_{i,t}) = \alpha + \log(P_{i,a[t]}) + \rho \log(Y_{i,t-1} + 1) + \sum_k \beta_k X_{k,i,t} + \sum_j \epsilon_j L_{j,a[t]} + \gamma_{i,a[t]} + \delta_{i,m[t]} + u_i + v_i$$

Diagram illustrating the components of the Bayesian GLMM equation:

- α : Mean of negative binomial distribution
- $\log(P_{i,a[t]})$: Population at risk (region i , year $a[t]$)
- $\rho \log(Y_{i,t-1} + 1)$: Previous dengue cases
- $\log(0) !?$: Ad hoc fix for $\log(0)$!?
- $\sum_k \beta_k X_{k,i,t}$: k different climate covariates
- $\sum_j \epsilon_j L_{j,a[t]}$: j different land cover covariates
- $\gamma_{i,a[t]}$: Yearly region-specific random effects
- $\delta_{i,m[t]}$: monthly region-specific structured random effects
- u_i : Time-independent region-specific unstructured random effects
- v_i : Time-independent region-specific structured random effects



Lowe et al. Stoch
Environ Res Risk
2016
Colon-Gonzalez et

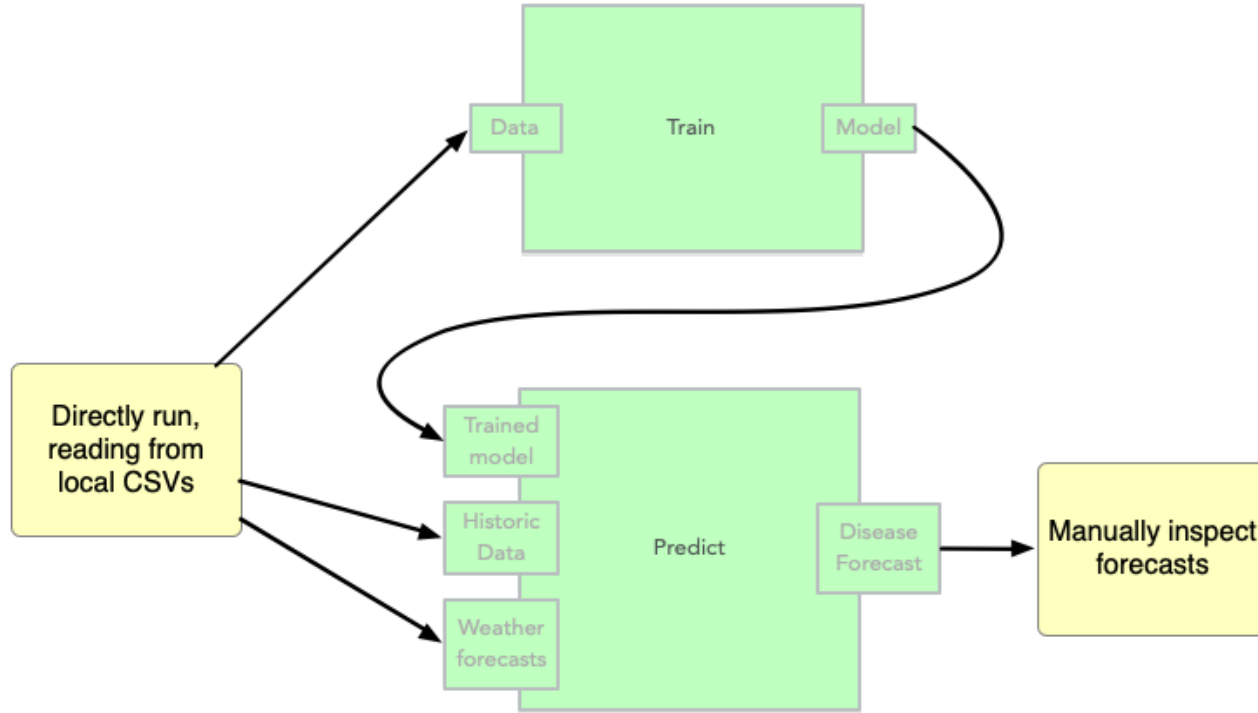
A minimalist model to run in isolation

Start here: the simplest possible thing that still works

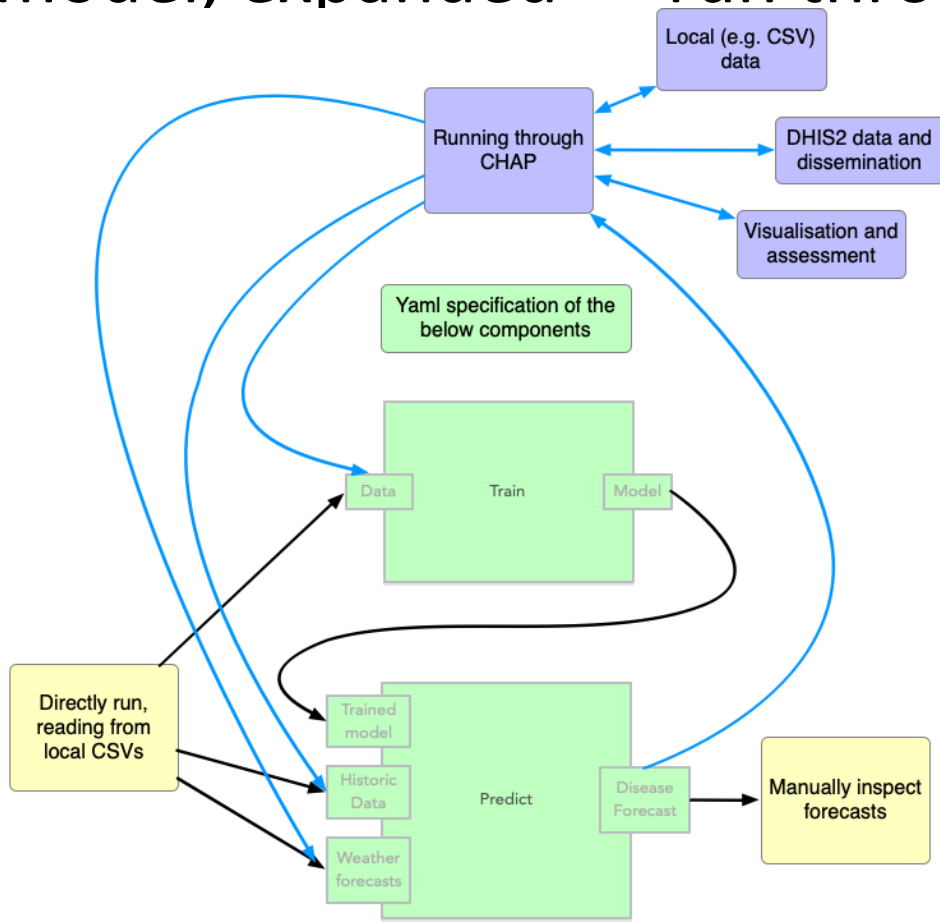
A more advanced model

Same shape, more inside — nothing about the interface changes

The interface CHAP defines — train, then predict



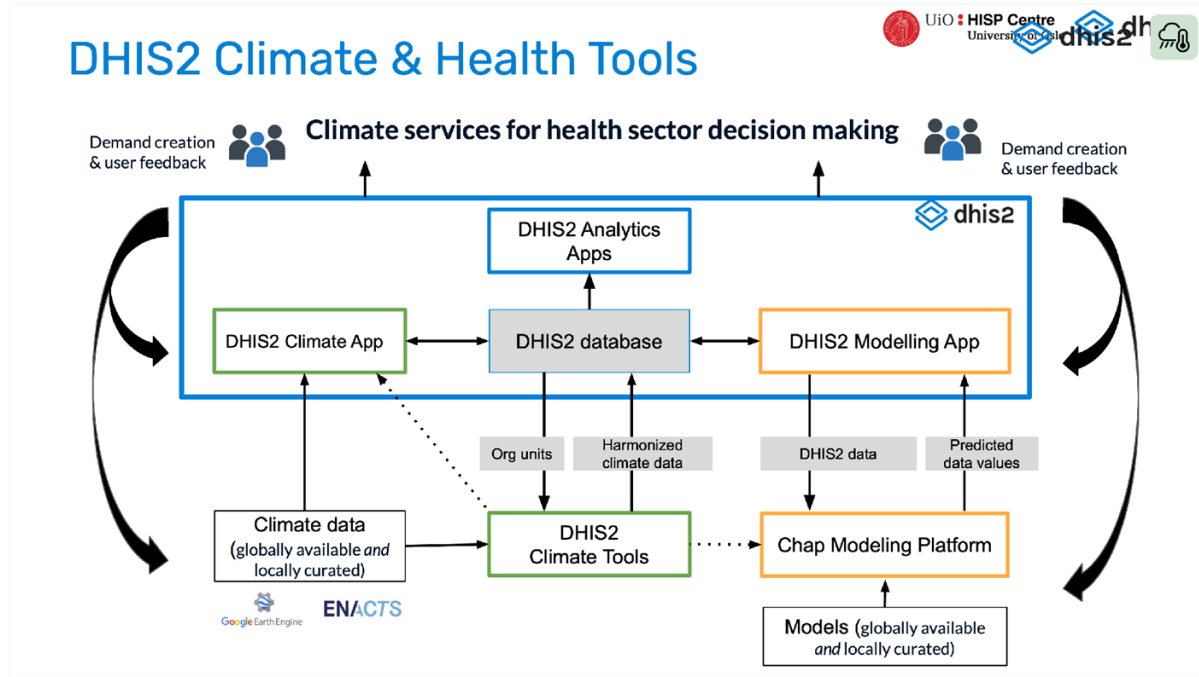
The same model, expanded — run through CHAP



Running the minimalist model through the CHAP CLI

Looking at evaluation plots from the CHAP CLI

Where it all sits — the full DHIS2 climate & health ecosystem



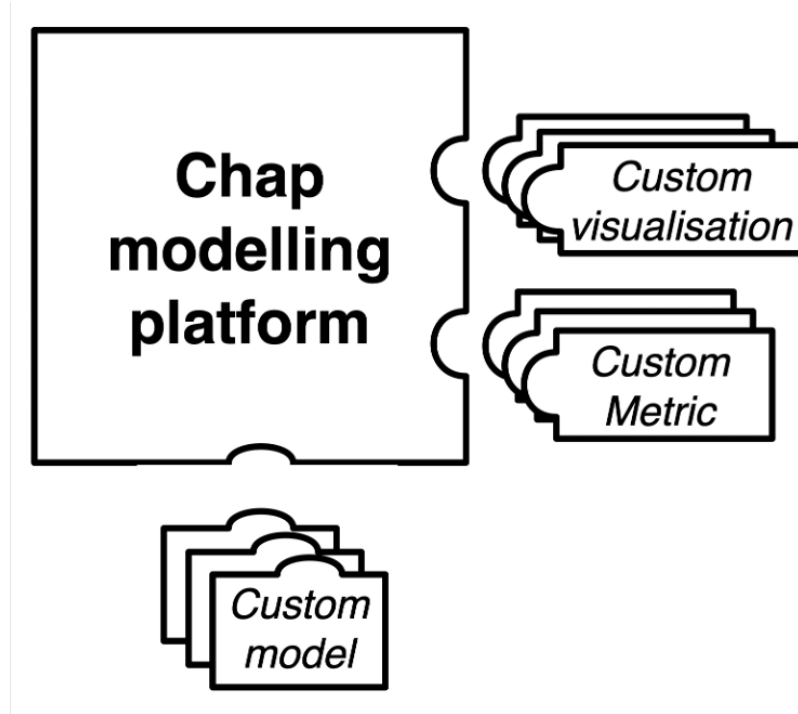
The modeling app

Configuring a model in the modeling app

Evaluating a model — including selecting the
data elements

Looking at side-by-side evaluation

Models, metrics and visualisations are all pluggable



Looking at predicted vs. actual, inside the
modeling app

Following up — predictions and DHIS2 import

(presented Monday)

Future plans (next year)

- Future models and Further capacity building on modeling (CSIDnet)
- More community-contributed metrics and visualisations
- Explainability
- AutoML
- Ensemble learning
- Data quality
- Effects of interventions (causality)

Thank you

Questions and discussions

Developing spatio-temporal models

Future models and further capacity building on modeling

Further community-contributed metrics and visualisations

Model explainability

Automatic tuning of models through AutoML

Model ensembles

Integration of data quality considerations

Estimating effects of disease interventions (causality)