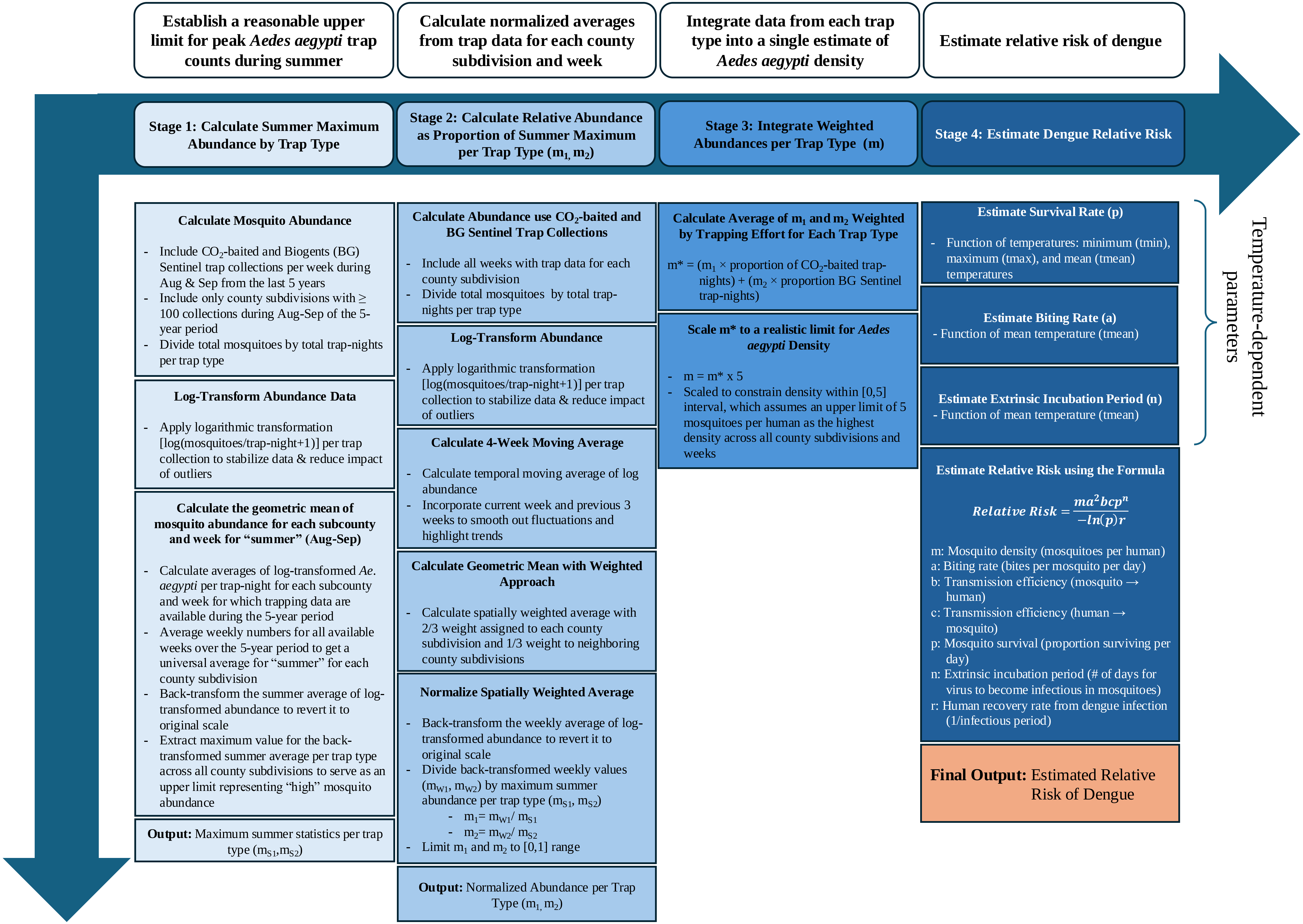
Establish a reasonable upper limit for peak Aedes aegypti trap counts during summer
Calculate normalized averages from trap data for each county subdivision and week
Integrate data from each trap type into a single estimate of Aedes aegypti density
Estimate relative risk of dengue
Stage 1: Calculate Summer Maximum Abundance by Trap Type
Stage 2: Calculate Relative Abundance as Proportion of Summer Maximum per Trap Type (m1, m2)
Stage 3: Integrate Weighted Abundances per Trap Type (m)
Stage 4: Estimate Dengue Relative Risk
Calculate Mosquito Abundance
- Include CO2-baited and Biogents (BG) Sentinel trap collections per week during Aug & Sep from the last 5 years
- Include only county subdivisions with ≥ 100 collections during Aug-Sep of the 5-year period
- Divide total mosquitoes by total trap-nights per trap type
Log-Transform Abundance Data
- Apply logarithmic transformation [log(mosquitoes/trap-night+1)] per trap collection to stabilize data & reduce impact of outliers
Calculate the geometric mean of mosquito abundance for each subcounty and week for “summer” (Aug-Sep)
- Calculate averages of log-transformed Ae. aegypti per trap-night for each subcounty and week for which trapping data are available during the 5-year period
- Average weekly numbers for all available weeks over the 5-year period to get a universal average for “summer” for each county subdivision
- Back-transform the summer average of log-transformed abundance to revert it to original scale
- Extract maximum value for the back-transformed summer average per trap type across all county subdivisions to serve as an upper limit representing “high” mosquito abundance
Output: Maximum summer statistics per trap type (mS1,mS2)
Calculate Abundance use CO2-baited and BG Sentinel Trap Collections
- Include all weeks with trap data for each county subdivision
- Divide total mosquitoes by total trap-nights per trap type
Log-Transform Abundance
- Apply logarithmic transformation [log(mosquitoes/trap-night+1)] per trap collection to stabilize data & reduce impact of outliers
Calculate 4-Week Moving Average
- Calculate temporal moving average of log abundance
- Incorporate current week and previous 3 weeks to smooth out fluctuations and highlight trends
Calculate Geometric Mean with Weighted Approach
- Calculate spatially weighted average with 2/3 weight assigned to each county subdivision and 1/3 weight to neighboring county subdivisions
Normalize Spatially Weighted Average
- Back-transform the weekly average of log-transformed abundance to revert it to original scale
- Divide back-transformed weekly values (mW1, mW2) by maximum summer abundance per trap type (mS1, mS2)
- m1= mW1/ mS1
- m2= mW2/ mS2
- Limit m1 and m2 to [0,1] range
Output: Normalized Abundance per Trap Type (m1, m2)
Calculate Average of m1 and m2 Weighted by Trapping Effort for Each Trap Type
m* = (m1 × proportion of CO2-baited trap-nights) + (m2 × proportion BG Sentinel trap-nights)
Scale m* to a realistic limit for Aedes aegypti Density
- m = m* x 5
- Scaled to constrain density within [0,5] interval, which assumes an upper limit of 5 mosquitoes per human as the highest density across all county subdivisions and weeks
Estimate Survival Rate (p)
- Function of temperatures: minimum (tmin), maximum (tmax), and mean (tmean) temperatures
Estimate Biting Rate (a)
- Function of mean temperature (tmean)
Estimate Extrinsic Incubation Period (n)
- Function of mean temperature (tmean)
Temperature-dependent parameters
Estimate Relative Risk using the Formula
Relative Risk = ma²bcpⁿ / −ln(p)r
m: Mosquito density (mosquitoes per human)
a: Biting rate (bites per mosquito per day)
b: Transmission efficiency (mosquito → human)
c: Transmission efficiency (human → mosquito)
p: Mosquito survival (proportion surviving per day)
n: Extrinsic incubation period (# of days for virus to become infectious in mosquitoes)
r: Human recovery rate from dengue infection (1/infectious period)
Final Output: Estimated Relative Risk of Dengue