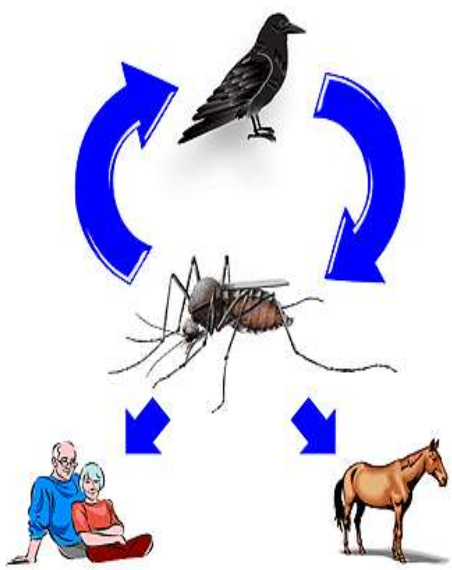
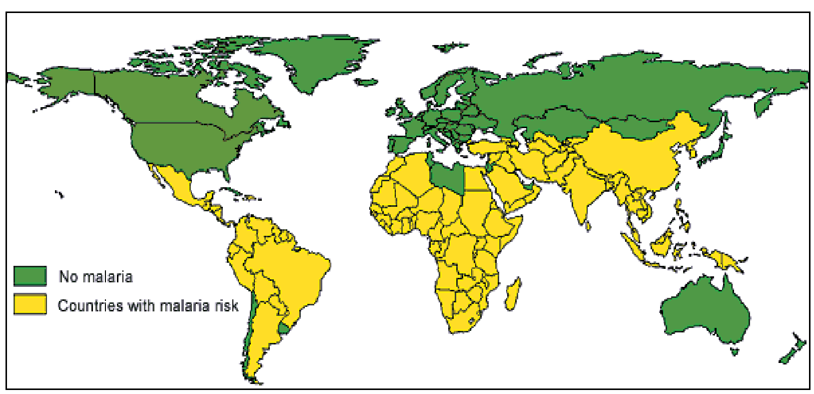
TEACHER BACKGROUND:
CLIMATE CHANGE AND DISEASE

Climate models project a global average warming by 2100 in the range of from 2 to 4 °C (2-8 °F). Increasing temperatures will be accompanied by changes in rainfall and humidity; the rate of occurrence of heavy precipitation events will increase; some areas will become drier due to evaporation increases resulting from higher temperatures.



A vector-borne disease (VBD) is one in which the microorganism which causes the disease is transmitted from an infected individual to another individual by a mosquito, tick, rat or some other agent. Other animals, wild and domesticated, sometimes serve as go-between hosts. The vector-borne diseases of most concern include malaria, Lyme disease, dengue fever, yellow fever, malaria, hantavirus pulmonary syndrome, and several forms of encephalitis. The diagram on the left shows the transmission cycle of West Nile Virus.



Climate constrains the ***range*** of many vector-borne diseases. VBDs are presently found mainly in tropical and subtropical countries and are relatively rare in temperate zones. For example, mosquitoes are limited to seasons and regions where temperatures stay above a minimum low temperature. Winter freezing temperatures kill many eggs, larvae, and adults. Climate also influences the availability of suitable habitat and food supply for vectors.

Weather affects the timing and intensity of disease outbreaks. Within their temperature range of tolerance, mosquitoes will reproduce more quickly and bite more in warmer conditions. Warmer temperatures also allow the parasites that carry the disease within mosquitoes to reach adulthood more quickly, increasing the chances that the mosquito will transfer the infection. Floods can trigger outbreaks by creating ***breeding grounds*** for insects. Droughts can reduce the number of predators that would normally control vector populations.

Modeling studies have predicted that rising temperatures will cause the spread of ***malaria*** and other diseases like dengue fever into areas where these diseases have been relatively rare. Climate change may also affect the gravity of the disease at a given location. Because there are so many variables to consider in relationships between species, the models do not take into account for all of the ways in which climate can affect the vector, human host, and parasite and the interactions among them.

Socioeconomic factors also affect the distribution of vector-borne diseases. It is more than obvious that climate change-related health impacts in general will not be uniformly distributed across the world's population. Poor nations will definitely be more susceptible that wealthy ones because of inadequate access to air conditioning, clean water supplies, electricity, health care and emergency response facilities. A good public health system, which includes prompt treatment of cases to reduce the risk of spread of the disease and ***mosquito-control measures***, helps to limit the spread of the disease in developed countries. For example, malaria once extended into the northern U.S. and Canada. However, by 1930 it was limited to southern regions of the U.S., and by 1970 had been wiped out. At the same time however, an increase in ***drug and pesticide resistance*** from overuse makes control of vector-borne diseases more difficult.

An analysis of World Health Organization data concludes that the poorest 20% of the world's population experiences a far higher burden of infectious diseases compared to the remaining 80% of the world's population and will continue to do so in a warming world at a significantly higher level. These threats to human health will hopefully serve to motivate governments to mitigate future climate change. Potential adaptations include raising public awareness through education, instituting advance warning systems and improving the public health conditions in the countries expected to be the hardest hit.