Humans vs. Mosquitoes

Object of the Game: Demonstrate how climate change will affect humans, mosquitoes, and the transmission of vector-borne infectious diseases.

Target Audience:

- Children in developing countries where vector-borne diseases such as malaria and dengue fever are prevalent.
- Red Cross Red Crescent workers, parents, teachers, physicians and nurses in developing countries.
- Participants at conferences on climate change and governmental and non-governmental health agencies (United Nations, World Health Organization, Red Cross Red Crescent)
- Students in the United States in grades 6–12.

Number of Players: A minimum of 6 players and 1 facilitator are needed to play the game. Designate 3 players as Humans and 3 as Mosquitoes. Divide the rest of the class into two groups—**Team HUMAN** and **Team MOSQUITO**—that provide support and strategy to these players. Players can trade places with teammates at any time throughout the game.

Time Required: 30–45 minutes.

Game Equipment:

- **Table space** for each group of 6 players.
- **6 Habitats:** Laminated pictures of places where mosquitoes can lay eggs that will hatch (birdbath, freshwater marsh, vernal pool, tire dump, rainwater barrels, and rain gutters).
- **23 Blood Tokens** (red glass pebbles or small river rocks): A **Blood Token** has multiple functions. It represents EGGS for Mosquitoes, LARVAE for Habitats, and HEALTH for Humans.
- **8 Climate Cards**, like "Chance Cards" in *Monopoly*®, introduce a realistic scenario that connects climate change, mosquito behavior, human susceptibility to disease and humanitarian aid.
- **6 Nametags** for players.
- **Dice** to roll to determine which Mosquito dies when a Habitat is cleared.

Game Plan: Play the game like *Rock, Paper, Scissors* mixed with *Freeze Tag*. When the facilitator says "1,2,3, GO!" each player commits to an action and freezes.

Play: Both teams just want to stay alive! It is better if the Humans win, but this is not always the outcome.

Mosquitoes WIN if they kill all the Humans first, by depleting their HEALTH!
Humans WIN if they kill all the Mosquitoes first, by clearing out Habitats where eggs hatch into LARVAE!

Who Will Survive?

Game Setup: In developing countries, people play the game without store-bought game pieces. Facilitators must be resourceful in finding game pieces such as rocks, sticks or small pieces of paper. Using rocks allows players to imagine that they are learning the game in a developing country, the way Red Crescent workers teach it.

- Select 1 facilitator to run the game and keep track of every intended action. The facilitator also collects Blood Tokens when a Mosquito bites or a Human kills a LARVA.
- Select 3 Humans and give them 12 Blood Tokens to divide. Divide up all tokens so Mosquitoes do not know which Humans have the most tokens and are healthiest. Humans stand on one side of the table and hide their tokens.
- Select 3 Mosquitoes and give them 2 Blood Tokens to divide up so Humans do not know who has extra eggs. Mosquitoes stand on the opposite side of the table and hide their tokens. All Mosquitoes are female. Blood Tokens represent EGGS for a Mosquito, as she must feed on blood to develop her eggs, which hatch into larvae.
- Set up 3 Habitats at the start of the game. The Mosquitoes can distribute 9 Blood Tokens among all 3 Habitats (where they will lay their eggs) any way they want.
  Suggested: Site 1 = 2 Tokens; Site 2 = 4 Tokens; Site 3 = 3 Tokens.
- Students who are not actively playing the game can split up and advise the players on strategy. **Team HUMAN** helps the Humans decide how to distribute their Blood Tokens (HEALTH). **Team MOSQUITO** helps the Mosquitoes strategize about egg placement in Habitats.

Rules:

- Blood transfusions are not allowed! One Human cannot give Blood Tokens to another Human.
- Mosquitoes cannot transfer eggs between themselves.
- Any Mosquito can lay eggs in any Habitat**.**
- A Mosquito dies when a Habitat is cleared. Roll the dice to determine which Mosquito dies. All of a Mosquito's eggs are lost when that Mosquito dies.
- Players must indicate clearly which action they intend to take. Mosquitoes must point clearly at the Human they intend to bite or at the Habitat where they plan to lay an egg that will hatch into a Larva. Humans must point clearly at the Habitat where they intend to kill a LARVA. Players cannot change their minds after seeing other players' actions.
- Humans cannot directly kill adult Mosquitoes. In real life, it is far more difficult for humans to kill adult mosquitoes than to clear the habitats where eggs hatch into larvae.

Troubleshooting:

- **"This game isn't fair!"** Humans have a slight statistical advantage, which reflects real life. It would be inappropriate to give students the idea that mosquitoes could overcome humans in this scenario.
- **Do not allow shortcuts.** If a Mosquito bites a Human and then that Human kills a Larva, allow both players to carry out their respective actions. Do not allow the Mosquito to take a shortcut by taking a LARVA from the Habitat. Even though this is the net result of these two actions, the purpose of each individual action would be lost or confused.

- **Humans cannot protect themselves all the time**. Humans are tempted to protect themselves, rather than risk Mosquito bites, by killing a Larva. Sometimes all three Humans may protect themselves. If so, take this opportunity to discuss how that strategy would be not be effective in real life and will not allow the game to move forward.

Playing the Game:
Round: When the facilitator says "1, 2, 3, Go!" each player must commit to an action and freeze. The facilitator then acknowledges players individually and allows each one to carry out an action. Discuss how this situation might reflect real life, according to what happened in the Round.

- Short Version: The facilitator collects transferred Blood Tokens when a Mosquito bites a Human or a Human kills a LARVA. Limiting the number of Blood Tokens in circulation allows the game to resolve within a few rounds. This will allow more student participation if you change roles between rounds.
- Long Version: If a Mosquito bites a Human, the Mosquito takes a Blood Token, which reduces the Human's HEALTH and symbolically turns into an egg. If a Human takes a LARVA from a Habitat, that Human keeps the Blood Token and is symbolically healthier (as in less likely to be bitten and infected). Keeping Blood Tokens in circulation lengthens the game, allowing more Climate Cards to be introduced to the game.

In each Round, Humans have the choice to protect themselves from Mosquito bites or to clear out a Habitat and prevent Mosquitoes from multiplying there. Humans cannot directly kill adult Mosquitoes.

Mosquitoes must either lay eggs in a Habitat or bite a Human. Mosquitoes do not kill Humans directly by biting, but they take a Blood Token when they bite. This weakens Human HEALTH by increasing the chance of disease transmission.

- Humans with few Blood Tokens could represent people who are more susceptible to disease because they are very old or very young, are already sick with another disease, or are malnourished.
- Humans with many Blood Tokens could be young and healthy or have good access to healthcare and nutritious foods.

	Goals	**Game Actions**
MOSQUITOES	(1) **Bite Humans** and feed on blood to develop eggs that hatch into LARVAE. (2) **Lay eggs** to repopulate Habitats with LARVAE.	(1) POINT AT A HUMAN. (2) POINT AT A HABITAT.
HUMANS	(1) **Protect yourself** from Mosquito bites. (2) **Kill LARVAE** by clearing out Habitats.	(1) CROSS ARMS OVER CHEST. (2) POINT AT A HABITAT.

Play a few rounds to help students learn the game. Then start using Climate Cards to change the course of the game. Draw cards randomly and follow the instructions on the card, or select cards to fit the situation or lesson. Climate Cards can allow Mosquitoes, Humans or Habitats to "come back to life" under certain circumstances.

A Habitat is lost when Humans have cleared all the Blood Tokens (killed all of the LARVAE in the Habitat). Remove the Habitat from the table. One Mosquito must die when a Habitat is cleared. Roll the dice to determine which Mosquito dies. All of a Mosquito's eggs are lost when that Mosquito dies.

Humans die when they run out of Blood Tokens (HEALTH). Players are on the honor system to report that they have no more Blood Tokens.

Conclusion: When one game ends, switch roles and begin a new game. Ask players to write a description of what happened in the game and how this reflects real life issues.

Background:

In Fall 2011, a group of Yale University professors gave their graduate students an assignment to help the Red Cross Red Crescent teach people how mosquito-borne diseases such as dengue fever and malaria could expand with climate change. The Yale students got together with student game designers from Parsons The New School for Design and they invented a game called **Humans vs. Mosquitoes**. Games are a great way to teach a lesson while having fun, so adults learn along with the children. Since its creation, adults and children around the world have played this game to learn how simple actions can help stop the spread of dangerous diseases. Thousands of people of all ages have learned the game in Kenya, South Africa, Uganda, Vietnam and the Philippines.

Game Focus:
To educate about (1) the risk factors for dengue, especially those related to climate change, and (2) the consequences of human behaviors that affect the spread of dengue.

Over 2.5 billion people worldwide are at risk of contracting dengue. From 50 to 100 million cases of dengue fever and 250,000 to 500,000 cases of dengue hemorrhagic fever occur each year in more than 100 countries. Dengue—found in tropical and subtropical climates, and in urban and semi-urban areas—is spread by infected female mosquitoes (*Aedes aegypti*). Four different viruses cause dengue. An infected person will develop lifelong immunity to that specific virus and transient immunity to the other three viruses.

There is no vaccine, cure or specific treatment for dengue fever, so prevention remains the only effective strategy. Dengue can be prevented through control of the mosquito population with biological, chemical and environmental methods. The Red Cross Red Crescent promotes dengue interventions that focus on the importance of clearing mosquito habitats rather than using insecticides. This game highlights the importance of prevention, especially by clearing mosquito habitats.

Climate change will influence the transmission of dengue. Fluctuations in rainfall, warmer weather and water shortages will all increase the prevalence of this disease. The Red Cross Red Crescent is one of the humanitarian agencies that are actively responding to the healthcare effects of climate change by organizing education and habitat clearing campaigns to reduce the spread of dengue in countries such as Peru, Bolivia and Paraguay. Climate change will place a greater burden on humanitarian agencies responding to dengue epidemics. These organizations will require increased support to reach the most vulnerable populations worldwide.

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