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BIODIVERSITY
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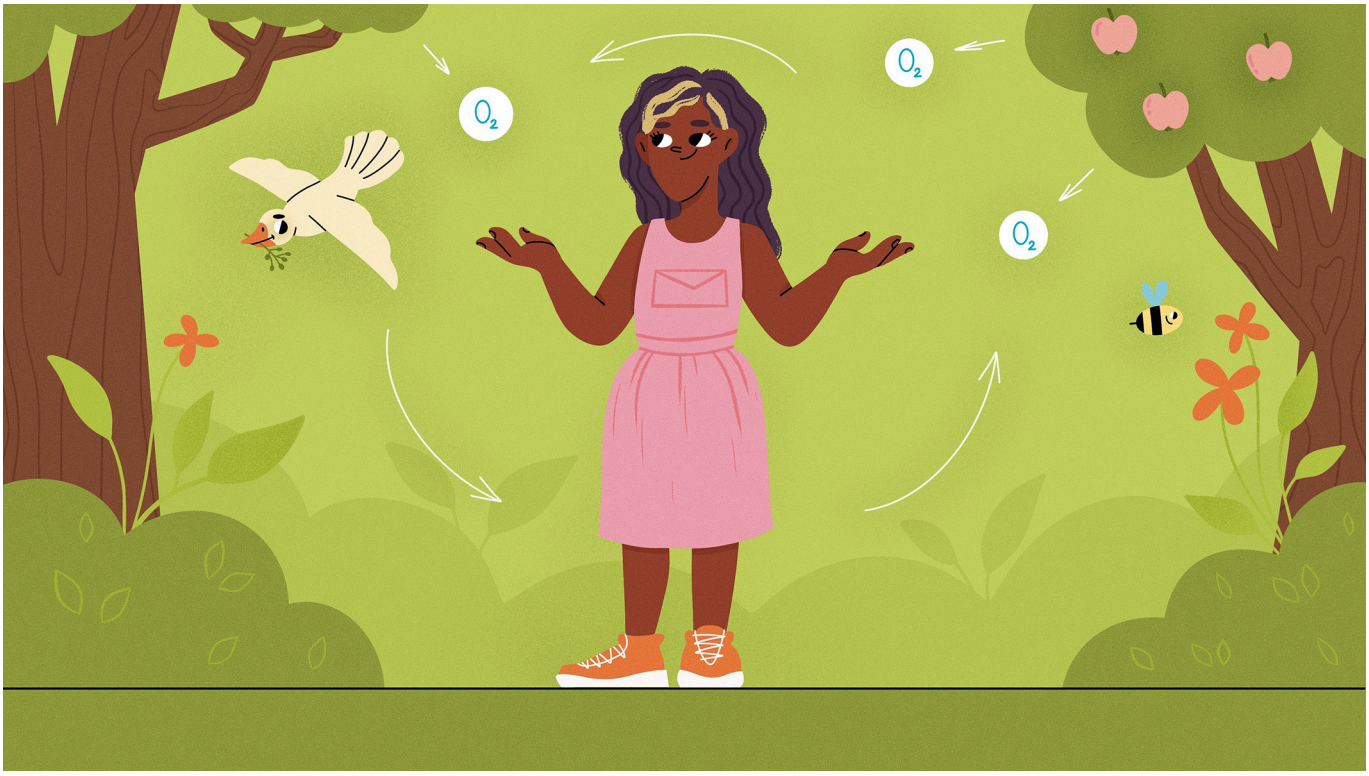

HUMAN HEALTH THRIVES THANKS TO BIODIVERSITY

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Did you know health is not just about not being sick? It is about feeling well. In healthy ecosystems, you can find plants, animals, water, rocks, and soil, all interacting with many microbes. Thanks to

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AGES: 14–15

IXCHEL

AGE: 8

this biodiversity we have clean air, fresh water, and nutritious food. Bees and other animals pollinate flowers to help grow fruits and vegetables. Birds spread seeds that grow into trees and forests. Plants clean the air we breathe. And people feel better in nature. Healthy ecosystems, therefore, keep people healthy. While public health programs teach people about healthy food and give them access to medicines, people make ecosystems healthier by protecting nature. You can help too, by taking care of your health and your surrounding ecosystem, learning about the world, and supporting decisions and actions that protect nature and people. By becoming guardians of Earth's biodiversity, we can all have a healthy future together.

WHAT IS HEALTH?

ECOSYSTEM

A place where organisms live that includes the non-living physical environment (water, light, temperature, etc.) they interact with.

MICROBES

Microbes or microorganisms are super tiny living things, like bacteria and viruses, that you need a microscope to see. They can be found almost everywhere.

Each morning, your body signals the start of a new day. Every movement, every pulse of your heart, and every thought of your mind reflects your health. Beyond the absence of disease, health is a state of physical, mental, and social wellbeing. Everyone's health is different because our bodies and minds are unique. However, being healthy includes having a resilient body and mind strong enough to face the challenges of everyday life and enjoy life. Just as an **ecosystem** thrives due to the roles and interactions of its plants, animals, and **microbes**, the wellbeing of your body depends on the organs, tissues, cells, and all the body's microbes, which operate together to shape your health. Your body is a finely tuned ecosystem, with each part carrying out a function. It provides you with energy and the ability to think, move, and feel. Your skeleton is the structure that supports you. Your heart sends oxygen and nutrient-rich blood throughout your body. Your digestive system transforms food into energy. Your brain is a command center. Your lungs take in the air you breathe. By observing and understanding the needs of your body, you can notice how different foods, activities, and amounts of rest and sleep affect your energy and moods. This way, you can better understand the diversity of things that keep you healthy. Health is a balance within the body that allows people to live well.

WHAT IS BIODIVERSITY AND WHY DOES IT MATTER?

BIODIVERSITY

A measure of the variety of genes, species, and ecosystems in a location or region.

If you look out a window, go outside, or visit a park, you may notice a bustling display of life: a variety of plants, chirping birds, buzzing bees, blossoming flowers, different grasses and jumping spiders, among many others. This lively scene represents a snapshot of **biodiversity**! Biodiversity is the variety of life forms on the planet, but it also involves the important relationships among and between life forms. Consider the Amazon rainforest, home to an unimaginable array of life, from plants to colorful fish and river dolphins. Yet, it is not just the existence of these species that is essential. It is the role of these species and their functions within the ecosystem, where everything works together, that

keeps ecosystems thriving and ensures that they can resist or adapt to changes—just like the organs, tissues, cells, and microbes in your body do for you.

Ecosystems can be viewed as essential life-support areas because of the vital benefits they provide thanks to biodiversity. Forests and other natural systems provide oxygen and absorb pollutants, cleaning the air we breathe. Plants also have a form of breathing, in which they absorb carbon from the air (or from water, for plants that live in water) and they release oxygen. In this way, plants help to keep Earth's temperature stable by reducing carbon in the atmosphere, while also releasing oxygen for humans and other animals to breathe. Natural environments also produce water, which is cleaned with the help water-living animals that filter the water. Birds, bats, and many other animals feed on fruit and thus disperse the seeds wherever they go, maintaining the place where they live over generations, or even creating new forests as they spread seeds to new areas. Plants provide us with material for medicines, clothing (such as silk), and even fuel (such as alcohol from sugar cane). Many plants also need insects and other animals and organisms to grow. Bees and other insects pollinate flowers that grow into fruits and vegetables we eat, and biodiversity can even be seen in what we eat. A colorful plate of fruits, vegetables, and grains indicates diverse nutrients and fiber that our bodies need to keep us healthy, including the microbes that live inside our guts.

WHY SHOULD WE CARE ABOUT BIODIVERSITY WHEN IT COMES TO HEALTH?

It feels wonderful to take a dip in a river or stroll through a lush forest, breathing in the fresh, clean air. These experiences are essential to our physical and mental health. For example, studies have discovered that people who have greater contact with nature and biodiversity from a young age have fewer allergies [1]. People who eat meals with lots of diversity, including fruits and vegetables, have better digestion, fewer illnesses, and greater energy levels. See? Our wellbeing is tied to the biodiversity within ecosystems, including our own bodies (Figure 1).

Today, many people live in cities, people travel more than they did in the past, and they use more natural resources. Farms occupy more space to produce more food for the world's growing population. Pollution and destruction of the environment and biodiversity loss can increase diseases for both humans and animals [2]. When humans use ecosystems without thinking about environmental impacts on land and water, they often disturb other species and their relationships. This can affect the health of soil, which we need to produce food, along with the abilities of rivers to provide water, plants to create natural medicines, and trees to maintain Earth's pleasant climate. Biodiversity destruction makes it less likely that we can have pleasant

Figure 1

Contributions of biodiversity to human health. Biodiversity can help us keep the doctor away!

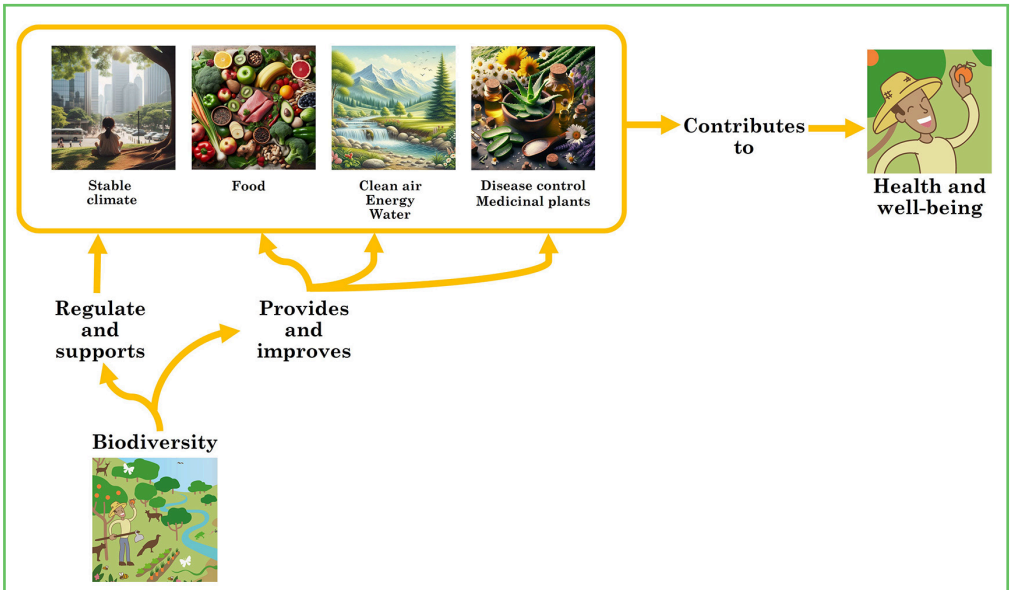

Figure 1

experiences in nature, so our mental health cannot benefit from great outdoor experiences.

Biodiversity loss may increase the risk of new infectious diseases, like those that are transmitted from animals to humans. In a healthy ecosystem, biodiversity can help control infections because different species keep each other in check. When we disturb biodiversity, for example when we cut down forests to convert them to farms and cities, the relationships between animal species and the microbes that live with them also change. Species may be exposed to new or more microbes that may cause disease (Figure 2). Or species that we are not used to interacting with may move into our surroundings, or we might move into theirs! So, understanding and respecting the delicate balance of biodiversity is not just about preserving an external environment; it also ensures our own health.

WHAT IS BEING DONE TO HELP HEALTH AND BIODIVERSITY—AND WHAT CAN YOU DO?

There are many ways to help our environment and human health. For example, pollution and climate change impact the environment and human health. Reducing what you use and reusing and recycling items can reduce greenhouse gas emissions that contribute to climate change and can prevent pollution from mining as well as the amount of waste in landfills and incinerators. Eating foods that grow closer to where you live can reduce environmental impacts through reducing travel and waste production. Plant-based diets often have lower environmental impact and greater positive health impacts. Learning more about your own impacts and health is one step, but being in contact with nature and learning about your surroundings is

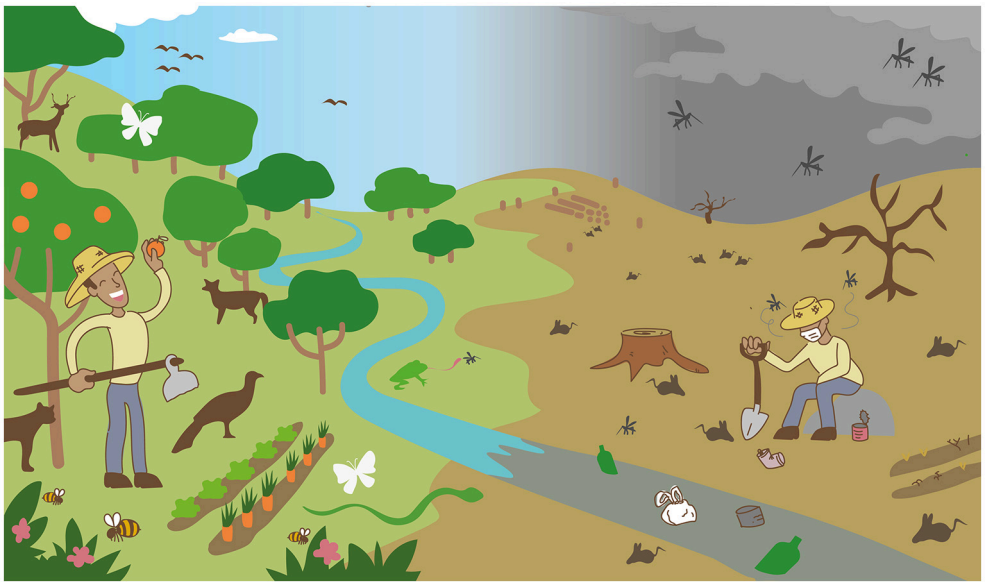

Figure 2

Figure 2

(Left) A healthier ecosystem has a higher level of biodiversity and is better for the health of people and the environment. **(Right)** A degraded, polluted ecosystem full of plastics and water contamination results in decreased biodiversity and people who are probably not very healthy.

another, because this can help connect you to the environment you live in.

Protecting natural areas like forests, rivers, lakes, and oceans is another way to help. Protecting these does not only mean creating national parks or protecting forests and the ocean. It is also about protecting people and learning from groups of people who have a long history of protecting biodiversity. **Indigenous peoples** have been strongly connected to the land and rivers for thousands of years, with traditional ways of farming, hunting, and fishing that can help to protect biodiversity and improve health. Better farming in ways that are less harmful to ecosystems can reduce the use of chemicals, maintain greater biodiversity, and help the soil stay healthy. There are also groups working to help species that might go extinct, like pandas or tigers, by protecting them and helping them to find safe places to live and thrive. Alongside these, there are health programs that support communities. We need a change to our whole system, so there are different groups working on improving our connection to the environment and nature. These groups often use the terms "One Health" and "Planetary Health" to describe the interconnectedness and need for balance in the health of humans, animals, plants, and the environment.

INDIGENOUS PEOPLES

The first people who lived in a place and are connected to it for a very long time, with their own traditions, languages, and ways of seeing the world.

Finally, experts are also developing new technologies, strategies, and plans to help understand and protect our planet's diversity and health [3]. Most importantly, experts are finding ways to work together, share knowledge, and make better decisions without damaging the environment. Examples are making plans to save endangered species, monitoring their movement and growth, understanding how our behaviors influence pollution and climate, or finding ways to help

plants grow better. These actions will all become even more important as we live in a warmer climate, so help us spread the word by telling friends that our own health thrives thanks to biodiversity.

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YOUNG REVIEWERS

ADALBERT STIFTER GYMNASIUM, AGES: 14–15

A class full of great minds, and most definitely without flaws in their interest in science. Every single one of us has the great ambition of becoming a scientist!

IXCHEL, AGE: 8

Ixchel is an 8-year-old girl. She spends her days going to school, playing basketball, and swimming. She enjoys playing with friends and drawing: her favorite color is blue! She also likes to go to the jungle and watch birds or insects, she is learning to take photos of nature and dance to traditional music. She wants to find a really big old rock and showcase it in a museum.

AUTHORS

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Renata Muylaert is an ecologist and likes to write things up, such as scientific articles and stories about people and animals. She works at the interface between ecology and epidemiology. Currently, she works at the Molecular Epidemiology and Public Health lab (Massey University, Aotearoa New Zealand) and co-chairs the International Union for Conservation of Nature Commission for Ecosystem Management for Human Health (IUCN CEM Human Health). She develops models and analytical approaches useful to inform decision making in wildlife conservation and public health, often using the One Health approach (*r.delaramuylaert@massey.ac.nz).

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Alexander von Hildebrand harmonizes health, environmental wellbeing, climate action, biodiversity, and community welfare in a life's work across the Global South. Armed with a master's from Erasmus University (1990) and a B.Sc. from the University of Kassel (1981) and fluent in five languages, he contributes to worldwide initiatives. Notably, he pioneered healthcare waste strategies, led climate-resilient healthcare endeavors, and championed multisectoral solutions. As a WHO temporary advisor, he shapes global safeguards, fortifies the Polio Program, and sparks inventive health and biodiversity projects within the One Health framework.

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Paula Ribeiro Prist is the principal scientist for conservation and health at EcoHealth Alliance. Her work focuses on understanding how the landscape structure derived from different land use changes can affect human health. She is especially interested in trying to understand the effects of landscape configuration and of forest restoration on hosts, reservoirs and vectors of zoonotic diseases, so that we can be able to manage landscapes to make them "healthier" for people. She is also the chair of the Human Health IUCN CEM group and steering committee for the One Health group of Future Earth.