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VISITING NATURE IN THE CITY DURING THE COVID-19 PANDEMIC

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YOUNG REVIEWERS:

LAURI
AGE: 14

YASH
AGE: 12

Can you think of places in the city where you enjoy nature? Urban nature may include parks and even backyards! Urban nature provides habitats for plants and animals and helps to promote human health. Our study examined how visiting urban nature sites may have changed during the COVID-19 pandemic, and which factors played a role in this change. We used map-based data and an online survey to answer our question for the city of Tel Aviv-Yafo in Israel. We found that visits to urban nature sites decreased for most of our participants. Participants who increased their visits to urban nature sites indicated that the sites helped their physical and mental health, were easy to get to, and were well maintained. We recommend that communities continue managing urban nature sites to improve accessibility and promote human health—both in normal times and in case of future pandemics.

WHAT IS URBAN NATURE AND WHY IS IT IMPORTANT?

Can you think of some areas in the city where you can enjoy nature? **Urban nature** may include parks, rivers, lakes, and even backyards. These places provide habitats for a diverse range of plant and animal species, so these sites support **biodiversity** [1]. Urban nature also supports human health because it provides opportunities for relaxation and recreation (Figure 1). **Urban ecology** is a scientific field that studies the interactions of species and their environments in urban areas, with a focus on keeping city residents and the environment healthy. It is important to protect urban nature because more than half of all people on Earth live in cities. We also need urban nature to stay healthy during and after pandemics, like the COVID-19 pandemic.

URBAN NATURE

The areas in cities that provide habitats for a diverse range of plant and animal species, and may include features like parks, rivers, lakes, green roofs, streams, and backyards.

BIODIVERSITY

The variety of living species such as plants, animals, fungi, and bacteria within a particular area.

URBAN ECOLOGY

The scientific study of the interactions of living organisms and the environments within urban areas.

Figure 1

Park HaYarkon in Tel Aviv-Yafo, Israel is an example of an urban nature site with relaxation and recreation opportunities.

COVID-19 has infected more than 676 million people. In response to the pandemic, many governments tried to keep people safe by having stay-at-home lockdowns, promoting social distancing, and closing many public places such as schools and indoor gyms. These actions helped to slow the spread of the virus, but they had some negative

physical and mental health impacts [2]. Many people felt isolated from their friends and families and had high stress levels. In addition, some people did not exercise as much as they did before the pandemic.

Urban nature provides accessible, outdoor places that can promote human physical and mental health [3], especially when many indoor public spaces are closed, like during the pandemic [2]. Researchers found that people who visit urban nature have decreased rates of depression, obesity, anxiety, and stress [4]. Some studies showed that people visited urban nature more often during the pandemic, but other studies showed that there was a decrease or very little change in the number of visits. There are not many studies that investigated a range of factors that may have influenced a change in visitation during the pandemic [5]. We wanted to know more!

RESEARCHING URBAN NATURE VISITS

In our study, we asked what influenced shifts in urban nature site visits during the COVID-19 pandemic. This type of research can help us to better manage urban nature sites. It can also help us to improve the health of people living in cities. We conducted our study in Tel Aviv-Yafo, Israel, which is located along the eastern side of the Mediterranean Sea. This city has a population of approximately 463,000 people and has 64 urban nature sites that are managed by the city (Figure 2).

GEOSPATIAL DATA ANALYSIS

Geospatial data describe the features of a site, using maps, photographs, and in-person visits. Geospatial data of urban nature sites can be analyzed to see if they have forests, playgrounds, rivers, etc.

WEB-BASED SURVEY

A series of questions for data collection that are designed to be delivered and completed by participants on the internet.

First, we performed **geospatial data analysis** of the urban nature sites in Tel Aviv-Yafo. Geospatial data tell us about the locations of places, such as cities on a world map. By looking at a map of Tel Aviv-Yafo, we identified the locations and features of the urban nature sites, such as playgrounds, sports fields, bathrooms, drinking fountains, and biking paths. We also identified the locations of environmental features within the urban nature sites, such as forests, lakes, rivers, and the Mediterranean Sea. This geospatial analysis helped us to understand the various components of the urban nature sites.

Next, we developed a **web-based survey** to ask Tel Aviv-Yafo residents about their urban nature site visits during and before the pandemic. A web-based survey is a collection of questions for people to answer using the internet. We hired a local survey company, Panel4All, to distribute our web-based survey to city dwellers.

In the survey, we asked participants how often they visited urban nature sites both before and during the COVID-19 pandemic (every day, one time per month, etc.), and then we calculated an estimated number of visits per year. For example, if a participant indicated that they visited once per month before the pandemic, then we multiplied this value by 12 months to estimate that they visited 12 times per year before the pandemic. We also asked participants if

Figure 2

Tel Aviv-Yafo, Israel, has 64 urban nature sites contained within the city boundaries.

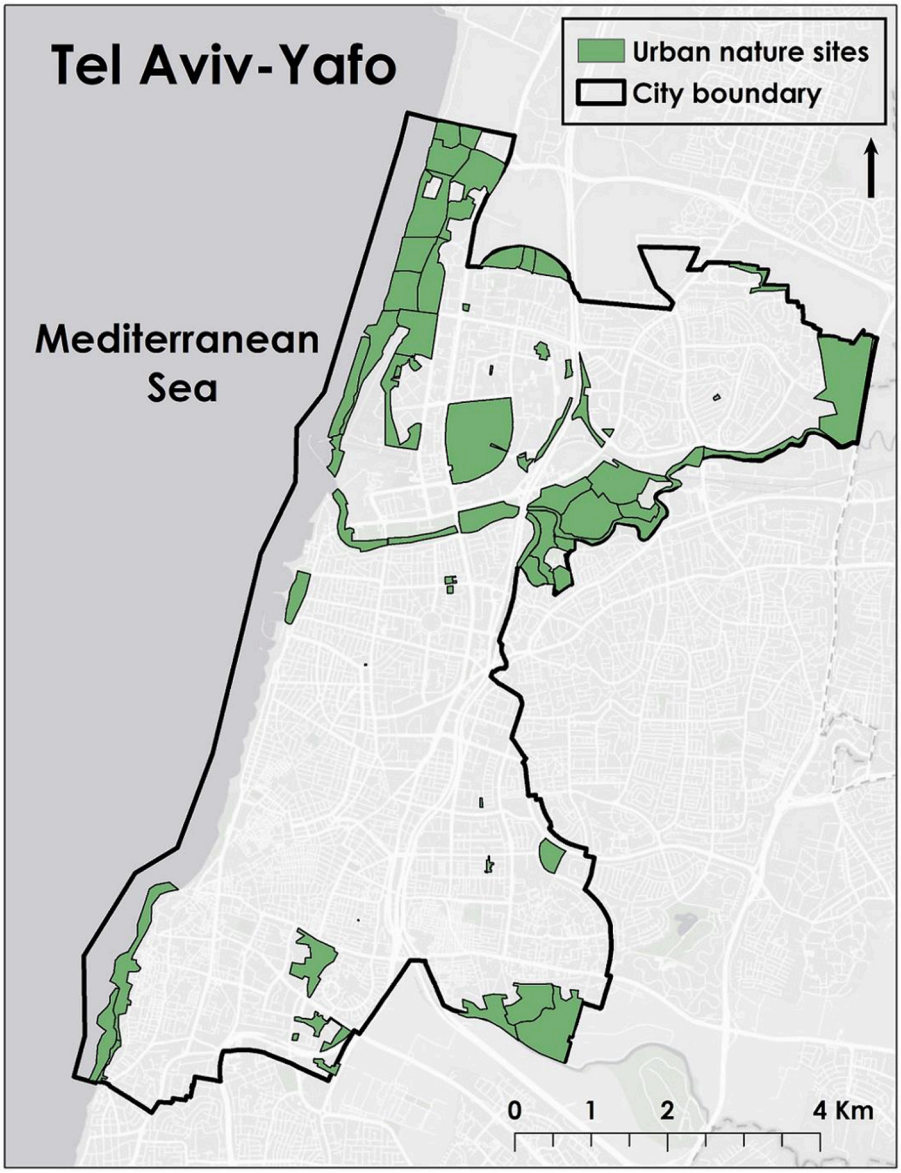

Figure 2

they visited alone or with friends or family and how they got there (walking, car, bicycle, bus, etc.). In addition, we asked participants to rate how much each urban nature site helped their physical and mental health, the site's accessibility (how easy it was to get to, etc.), and the site's maintenance. Finally, we asked participants to share information about themselves, such as their age, education level, gender, and employment.

VISITATION CHANGE INDEX

An equation to calculate the relative change in urban nature site visits for each participant.

We then used an equation to calculate the change in urban nature site visits for each participant (see below). This equation gave us a **visitation change index** value for each participant, on a scale of −1 to 1. For example, if a participant visited an urban nature site 10 times a year before the COVID-19 pandemic, but did not visit at all during the pandemic, then their index value would be −1. On the other hand,

if a participant did not visit an urban nature site before the pandemic, but visited 10 times during pandemic, their index value would be 1. This tells us that the second participant visited an urban nature site relatively more often during the pandemic and the first participant visited relatively less often.

$$\text{Visitation change index} = \frac{(\text{Frequency during COVID19} - \text{Frequency before COVID19})}{(\text{Frequency during COVID19} + \text{Frequency before COVID19})}$$

After collecting these data, we wanted to understand which factors influenced visitation of urban nature sites during the COVID-19 pandemic. We did this by creating a mathematical equation called a **multiple linear regression model**, which helped us to estimate the relationship between a dependent variable and two or more independent variables using a straight line. In our case, we estimated the relationship between the visitation change index (dependent variable) and the data we obtained from the geospatial analysis and the web-based survey (independent variables).

MULTIPLE LINEAR REGRESSION MODEL

A mathematical equation to estimate the relationship between a dependent variable, like urban nature site visitation, and two or more independent variables like different site characteristics, using a straight line.

WHAT INFLUENCED URBAN NATURE SITE VISITS DURING THE PANDEMIC?

A total of 458 participants completed our web-based survey, and of these, 92% visited urban nature sites at least once before or during the COVID-19 pandemic. Of the participants, 53% decreased their number of visits during the pandemic, 26% increased, and 21% had no change. Only 1.7% of visitors visited urban nature sites for the first time during the pandemic. Our original source article (see below) provides a map of the urban nature sites that were visited relatively more or less during the COVID-19 pandemic. This article also provides graphs of the types of activities that participants enjoyed in the urban nature sites.

Participants who visited urban nature sites relatively more often during the pandemic reported that the sites had positive impacts on their physical and mental health (Figure 3). These participants also gave higher ratings to the nature maintenance and accessibility of the urban nature sites. We found that these participants were younger and more likely to visit a site with a spouse. This told us that participants enjoyed socializing with someone in the urban nature sites, but that they generally did not socialize with those outside their household, probably to decrease their risk of contracting COVID-19.

The participants who visited urban nature sites relatively more often tended have shorter visits and not to travel by car. However, these participants did not tend to have very high overall ratings of their visits. This implies that even short visits to accessible urban nature sites had health benefits for our participants, even if they thought that their experience could have been better in general.

Figure 3

Results of the multiple linear regression model showed which factors were significantly positively (thumbs up) or negatively (thumbs down) associated with the visitation change index. For example, participants visited relatively more frequently during the pandemic when they felt that the urban nature sites helped their physical and mental health. Participants who visited relatively more often did not like to travel by car and did not like longer visits to the urban nature sites.

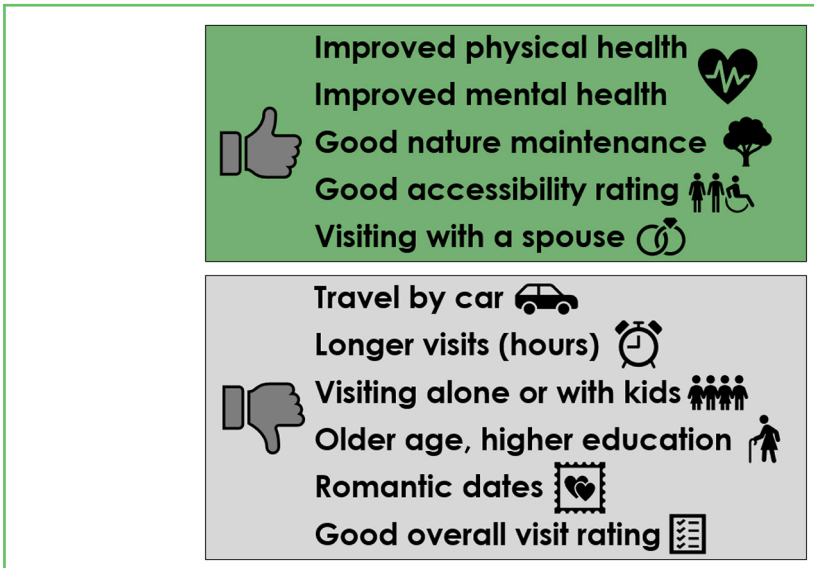

Figure 3

Contrary to our predictions, urban nature site visitation decreased for most of our participants during the COVID-19 pandemic. This was similar to the results of some studies of cities in China and the United States, but different from research on other cities in Australia, Europe, and the United States, which showed an increase or no change in visitation. These differences may be due to pandemic-related restrictions and the accessibility of urban nature sites in various cities and countries. Social factors also seemed to play a larger role in the relative change in visitation than did specific features of the urban nature sites. For instance, older people tended to visit urban nature sites relatively less than younger people, maybe because they were more worried about being infected with COVID-19.

Our study had a few limitations. Our participants *estimated* the number of times they visited urban nature sites before and during the COVID-19 pandemic, but they might not have remembered their number of visits accurately. In addition, we focused on urban nature sites managed by the City of Tel Aviv-Yafo, but participants may have visited other types of nature within or outside the city that were not in our web-based survey. In future studies, it would also be beneficial to ask participants about the particular neighborhoods in which they live.

PROTECTING URBAN NATURE

Overall, we learned that many participants felt that urban nature sites contributed positively to their physical and mental health during the COVID-19 pandemic. Participants who visited relatively more often during the pandemic said that the urban nature sites were easily accessible and were well maintained. These participants also tended

to be younger and preferred not to travel by car. Based on these results, we believe that it is important for our communities to continue supporting the creation and maintenance of urban nature sites in all city neighborhoods, so that they are easy and pleasant to visit. This way, people of all ages can continue to enjoy the many benefits of urban nature!

We must also ensure that urban nature is accessible to people of all backgrounds, including different genders, racial/ethnic backgrounds, and those with physical and/or mental health conditions. In many cities, including the one we studied, there is an unequal distribution of urban nature sites across neighborhoods. We recommend that more urban nature sites be created and maintained in *all* neighborhoods. By balancing social and environmental goals for urban nature, we can protect biodiversity, expand the field of urban ecology, and improve human health—during normal times and during any future pandemics.

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ORIGINAL SOURCE ARTICLE

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CONFLICT OF INTEREST: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

YOUNG REVIEWERS

LAURI, AGE: 14
My name is Lauri, I am 14 years old and I live in southern Germany. I like skiing, climbing, skateboarding, and listening to music. I also love the Nordic countries. In my free time, I read or go out in nature or both!

YASH, AGE: 12
I am a curious middle-schooler with a wide range of interests in math, science, music, tennis, geography, and building large lego sets. I love volunteering at a local animal rescue and write their monthly youth newsletter. I play the drums and am learning to play many other percussion instruments in my school band. I am considering being a lawyer when I grow up because I am getting good at presenting a fair argument with my parents.

AUTHORS

MICHELLE L. TALAL

Michelle grew up in Portland, Oregon, United States, where she enjoyed learning all about nature in the forests and fields near her home. As a child, she enjoyed going to science camp to learn about ecology and environmental conservation. Her favorite animals are a black-and-white Shih Tzu named Pufik and a fluffy Chow Chow named Tusik. She received her Ph.D. in environmental science and is now a Zuckerman postdoctoral scholar at Tel Aviv University in Israel. She is passionate about nature in cities and how it can be managed for both people and the planet. *michelle.talal@gmail.com

MICHAL GRUNTMAN

Michal Gruntman is a plant ecologist from Tel Aviv University who is interested in the way plants interact with each other and with their environments. She also studies the way human-made environmental stresses like heavy metals or nighttime light pollution affect plants. She enjoys looking at plants and animals in rural and urban environments to learn how they influence one another and also people.