

2-fold increase in fruit and vegetable consumption among those participating in community gardening over those who did not.

The practice of Shinrin-Yoku, meaning “taking in the forest atmosphere” and also called forest bathing, originated in Japan in the 1980s and is utilized as a form of Japanese medicine and preventive health care (Hansen, Jones, & Tocchini, 2017). This practice involves being immersed in a forest atmosphere and being mindful of all senses, and has shown numerous measurable physiologic effects. Park, Tsunetsugu, Kasetani, Kagawa, and Miyazaki (2010) found evidence that walking in the forest was associated with lower pulse rate, lower blood pressure, lower sympathetic nerve activity and greater parasympathetic nerve activity than walking in an urban environment. Their studies also measured the stress hormone cortisol and discovered lower concentrations in those exposed to the forest. Li (2010) found that forest bathing is associated with increased natural killer (NK) cells and increased NK cell activity, as well as increased levels of anti-cancer proteins, suggesting enhanced immune functioning resulting from such engagement with nature.

Psychological Effects

Much research into the nature-health connection has focused on brain health, including mental health benefits, attention and cognition effects, and perceptions of wellbeing. Forest bathing, discussed above in regard to physiological effects, has been shown to reduce both acute and chronic stress, with participants reporting lower levels of hostility, depression, and anxiety (Morita et al., 2011). Taking a walk in a natural setting, as compared to an urban setting, can reduce negative affect and rumination, the term used to describe the psychological phenomenon of repeatedly considering and focusing on one’s thoughts or problems without resolution, and thought to contribute to depression and anxiety symptoms. (Bratman, Daily, Levy, & Gross, 2015).

Access to nature, whether viewing trees out a window, taking wooded walks, or gardening has demonstrated positive effects on attention and cognition (Lee et al., 2015; Bratman et al., 2015). Symptoms commonly associated with Attention Deficit Hyperactivity Disorder (ADHD), such as impulsivity and inattention, are reduced when people are exposed to nature settings and views, leading some to postulate that nature therapies may be an effective treatment or adjuvant therapy for ADHD and related conditions (Kuo & Faber Taylor, 2004). Commonly experienced symptoms such as

inattention, low mood, and poor sense of well-being may be alleviated with nature experiences. This fact, as explained by some researchers and philosophers, can be explored further and can point to the hypothesis that modern disconnection from the natural world may, in fact, produce such symptoms to begin with. Ecopsychology, which “explores the synergistic relation between personal health and well-being and the health and well-being of our home, the Earth,” (<https://www.ecopsychology.org/>), is a distinct discipline spurring new treatment modalities and research.

Social/Community Effects

Not surprisingly, these beneficial relationships between people and nature seen on individual levels translate more broadly to effects on communities. Green views from the windows of public housing complexes are associated with a stronger sense of community, more feelings of safety, and fewer reports of crimes (Kuo et al., 1998; Kuo & Sullivan, 2001). Living in areas with high proportions of trees and green space may protect against cardio-metabolic illnesses (Hansen, Jones, & Tocchini, 2017) and is associated with overall lower levels of morbidity and mortality (Maas et al., 2009). Urban planners and architects may consider such benefits when designing residences, and public health professionals can advocate for “green design” for health. Cities and counties can promote community access to natural spaces through investing in land conservation and recreation infrastructure.



Children

Children today live indoors much more so than in any previous generation, due to urbanization, parental fears, and electronic use, among other factors. This shift has caused concern among health professionals, educators, psychologists, and child development specialists. Richard Louv's book *Last Child in the Woods* (2008) explores this disconnection from nature and addresses what he calls Nature Deficit Disorder, describing the ramifications of human's- in particular children's- alienation from the natural world. Fortunately, the benefits that children can gain from having access to nature, and may in fact need for healthy development, are gaining more attention and support. Research shows that children with more outdoor free time are more active and less sedentary (Gray et. al., 2015), have less stress and show more creative play (Chawla, 2015), and exhibit reduced symptoms of ADHD (Kuo, F., & Faber Taylor, A., 2004).

Recognition of these benefits has spurred trends such as "forest schools" and green schoolyards. One organization, the Children and Nature Network (C&NN), was developed to further the mission to equitably connect children with nature to help them, and natural places, thrive by advocating for policy change, investing in communities, and sharing research and educational resources. Access their website at <https://www.childrenandnature.org/>. Please view this interview with Cathy Jordan, PhD., consulting research director for the C&NN and associate professor of pediatrics and extension at the University of Minnesota, for a more in depth discussion on children and nature and this organization:



Older Adults

Engaging with and having access to nature can significantly impact the health and wellbeing of people as they age.

Studies show that seniors who spend time outdoors in parks, tree-lined streets, or gardens have improved mobility and physical health, less symptoms of depression, a reduction in risk for dementia, and improved social connections (Wolf & Housley, 2016). For those with Alzheimer's, time spent in a garden on a daily basis has shown to reduce agitation and wandering (Day, Carreon, & Stump, 2000). With social isolation and its associated ill-effects common among older adults accessible common green spaces and community gardens provide opportunities for social interaction and have been shown to increase older people's sense of community belonging (Kweon, Sullivan, & Angel, 1998). Nature Sacred (<https://naturesacred.org/>) is an organization dedicated to promoting urban nature sanctuaries for health and healing and has an informative section on nature and older populations which can be found here: <https://naturesacred.org/nature-seniors/>.

Low Income and Disadvantaged Communities

While opportunities to engage with nature have shown benefits for virtually all populations, these effects may be even more pronounced in disadvantaged or low-income communities. A large, observational population study in England found that populations with the most exposure to green space had lower levels of health inequality related to income deprivation than those with less exposure to green spaces (Mitchell & Popham, 2008). This suggests that low-income groups can benefit even more from living with nearby nature than high-income groups. Some cultural groups, such as Native Americans, maintain a spiritual and cultural connection to the land, and this relationship can bolster wellbeing among these communities.

Unfortunately, access to nature and green space is unequal. Low-income and minority neighborhoods often lack safe and maintained parks and trails to utilize. Transportation may be a barrier for such groups to access parks further away, such as National Parks. Research shows that African Americans visit parks less often than Caucasian people, and that this is often the result of lack of access (Weber & Sultana, 2012). Low-income and minority people frequently live in urban areas and apartment buildings, where space for outdoor play or gardening is limited or absent.

One initiative being piloted in an urban county in Minnesota, with grant funding from the state, aims to address these disparities using gardening as an avenue for health. This program, called GROW Rx, is a partnership between the county public health department and a local community organization that empowers providers to "prescribe" gardening to their patients to address health

concerns. Providers at an urban, Federally Qualified Health Center serving primarily low-income, minority, and immigrant patients can write a prescription which will enable the patient to receive a plot in a nearby garden or a small garden box along with soil, plants, and supplies needed to create a garden. The organizers of the project hope to not only promote activity and healthy eating, but to provide a sense of agency and empowerment to disadvantaged people through gardening.

**Don't forget to
give your plants...**



  
**Sunshine, water,
and LOVE!**

WHAT IS GROW Rx?

Grow Rx is a program with the Urban Farm and Garden Alliance that seeks to address a holistic view of illness and health by prescribing gardening.



WHY PRESCRIBE GARDENING?

Gardening, especially gardening to grow food, can improve both individual and community health. Growing not only yields fresh, nutritious, and organic food but engages neighbors in an activity that connects them to their bodies, to others, and to the earth. These connections can have transformative impacts on physical, emotional, physiological, and spiritual health.

GROW Rx



HOW DOES GROW Rx WORK



Health Practitioners
write a prescription
for gardening.

The Urban Farm and Garden
Alliance fills the prescription
with a garden plot or garden
box and healthy soil.



Community members
receive seeds, plants,
tools, and resources
tailored to fit their
desires for their garden.
Continued support and
relationships are grown
to enhance healthy
gardens, healthy
communities, and
healthy people.



BENEFITS:



Community Asset

- A place for community events and gatherings
- A safe place for children to play outdoors
- A place for the natural environment to thrive within the paved confines of a city.
- Help in "reducing flood risk and moderating climate and pollution, which have knock-on benefits for health"
- A more holistic type of neighborhood security, a place where neighbors look out for one another, a community presence on the street.



Physical Activity

- Community gardeners had "significantly lower BMIs" than non gardeners: 1.84 units lower for women, 2.36 units lower for men"
- neighbors who worked in the garden "had lower odds of being overweight or obese" than those who did not."
- Gardening may not completely solve the obesity problem in america, but direct and indirect results of gardening could certainly improve the health of many.



Mental Health

- Gardens can be a place of solace and mental healing.
- Mayfield Nurseries' (Pamphile, England) prescription gardening program addresses "depression, anxiety, PTSD or OCD, phobias or agoraphobia" and other mental health ailments."
- One study found that mortality rates were 93% higher in "less green areas" for "deprived groups", but only 43% higher for the same groups in greener neighborhoods."



Neighborhood Support

- Living near a community green space can improve "networks of support and interaction that facilitate bonding, collaboration, problem solving, and community action"
- Cultural or recreational events (think BBQs or sports events) "provide an opportunity for residents to interact with others outside of their family."

*References available upon request

QUESTIONS? WANT TO GET INVOLVED?

Website:
urbanfarmandgardenalliance.org/

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Urban Farm &
Garden Alliance



This project is partially funded by a \$40 million State Innovation Model (SIM) cooperative agreement, awarded by the Minnesota Department of Health and Human Services in 2013 by The Center for Medicare and Medicaid Innovation (CMMI) to help implement the Minnesota Accountable Health Model

Nursing Implications

By virtue of our numbers, our multifaceted roles, and our trust among the community, nurses are in a strong position to promote health through supporting engagement with nature. As a broader view of health and wellbeing emerges among the healthcare community, and openness to complementary and alternative treatments and prevention modalities increases, nurses can be on the front lines of recommending, implementing, and advocating

for nature-based health and healing practices. One example of this synergy is at the University of Minnesota. The Earl Bakken Center for Spirituality and Healing, which supports interprofessional education and research in health and wellbeing, has recently merged with the School of Nursing. The Center counts nature-based therapeutics as a focus area (<https://www.csh.umn.edu/education/focus-areas/nature-based-therapeutics>) and supports environmentally responsible health care and nature as a path to healing (<https://www.csh.umn.edu/education/whole-systems-healing/eco-healing>).

Nurses working at the bedside in the hospital environment can consider their patients' view from the window, opening blinds to allow views of greenery when possible, as a view of nature from post-operative patients' rooms has been associated with better outcomes (Ulrich, 1984). Ambulatory clinic nurses can ask patients about their access to nature and the outdoors and provide information on the benefits of and options for incorporating this into their lives. Advanced practice nurses may be in a position to participate in a program such as GROW Rx or other nature prescription opportunities to support their patients' health. Another organization supporting this prescription model is Park Rx America, supporting practitioners in prescribing visits to parks to treat conditions. Their website is <https://parkrxamerica.org/>.

Public health nurses in the community can assist clients and families to locate and access nearby nature and can educate the community on the health

benefits. The American Public Health Association, which includes a public health nursing section, supports the advancement of population health via access to nature. You can access their policy statement, including proposed recommendations and action steps, here: <https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2014/07/08/09/18/improving-health-and-wellness-through-access-to-nature>.

Further research is needed to expand the base of evidence for engaging with nature for health promotion and utilizing nature to treat and heal, and the nursing perspective is welcomed. Nurse researchers Patricia Hansen-Ketchum and Elizabeth Halpenny recommend several areas for further research, including everyday experiences of engaging with nature, especially in rural settings, people's perceptions of barriers, conditions that contribute to disparities in nature engagement, practitioners and policy-makers perceptions of nature-based health promotion, and nature-based interventions in communities, among other areas (2010).

Finally, nurses' voices for advocacy are invaluable. With the knowledge of this intersection between the natural world and human health, nurses can inform patients, other health team members, communities, organizations, and policy-makers. They can use their expertise and the trust from their communities to advocate for incorporating nature-based therapies into treatment plans. They can provide health-related insight to planners, local agencies, and organizations to ensure that the value of green space with regard to health is understood when considering projects and developments. They can bring issues of land conservation, park preservation, and equitable access to natural spaces to candidates and elected officials.

Nurses also have an obligation to consider the health of future generations, and this depends on our current values and decisions. To ensure the protection of human health and the planet's, it will be necessary to create a culture that understands, values, and respects the natural world as irreplaceable and as essential for our own wellbeing. Nurses' voices are needed to create that culture. "In the end we will conserve only what we love; we will love only what we understand; and we will understand only what we are taught." - Baba Dioum, 1968.

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Unit VI:

Climate Change

INTRODUCTION

Climate change is considered our greatest public health threat and our greatest opportunity. Despite the world recovering from and struggling with the impacts of COVID-19, if left unchecked, climate change remains an existential human crisis. Nurses have been on the frontlines of addressing climate change by educating other nurses, patients, communities, and policymakers about our changing climate and consequences for human health. Nurses have also advocated for communities at risk and health protective climate policies at the local, state, national, and international levels. Additionally, nurses are contributing important climate change and health research. This chapter highlights the health impacts of climate change across the lifespan and across populations. Climate change will affect every aspect of nursing care and nurses must be prepared. The first chapter of this unit provides an in-depth overview of climate science, its impacts on human health, and nursing leadership. This unit also includes chapters on climate change and mental health, migration of people, and the impact of climate change on older adults and inequities within communities of color. As you read these current and important chapters, consider what opportunities you see to influence climate change mitigation and adaptation to support resilient populations.

CLIMATE & HEALTH

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INTRODUCTION

There is growing evidence and concern about the impacts of climate change on health and how to respond to these impacts. As trusted health professionals, nurses have an opportunity to inform others and limit adverse health impacts.

WHAT IS CLIMATE CHANGE?

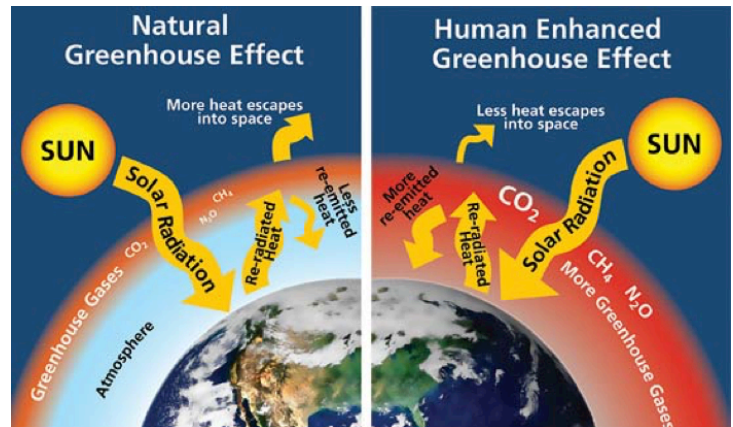
Climate change is a significant and lasting change in the distribution of weather patterns over periods of time ranging from decades to millions of years. It may be a change in average weather conditions, or in the distribution of weather around the average conditions (i.e., more extreme weather events).

The greenhouse effect is a process caused by greenhouse gases, which occur naturally in the atmosphere. This process plays a crucial role in warming the Earth's surface, making it habitable. However, greenhouse gas emissions (generated by humans) disrupt the natural balance and lead to increased warmth. Greenhouse gases in the atmosphere prevent energy from immediately escaping from the Earth's system. The greenhouse gases then distribute this energy, warming the Earth's surface and lower atmosphere (See Figure 1).

Figure 1

Left - Naturally occurring greenhouse gases—carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O)—normally trap some of the sun's heat, keeping the planet from freezing. Reproduced as part of public domain.

Right - Human activities, such as the burning of fossil fuels, are increasing greenhouse gas levels, leading to an enhanced greenhouse effect. The result is global warming and unprecedented rates of climate change (Will Elder, NPS). Reproduced as part of public domain.



<http://www.nps.gov/goga/naturescience/climate-change-causes.htm>

CLIMATE CHANGE AND HEALTH

Human activities are causing environmental changes of epidemic proportions. The earth's temperature is increasing, mainly as a result of human activity such as burning fossil fuel and greenhouse gas emissions. Emissions come from energy production (e.g., coal-fired power plants), transportation (e.g., automobiles), industry (e.g., hospitals), and agriculture (e.g., fertilizers). These changes are occurring globally at a rate that exceeds what the world has experienced over the last 650,000 years (Parry, Canziani, Palutikof, van der Linden, & Hanson, 2007).

Climate change can be experienced as extreme weather events such as heat waves, melting of snow and ice with rising sea levels, changes in precipitation resulting in flooding and drought, more intense hurricanes and storms, wildfires, as well as poorer air quality. These changes highlight the critical need for us to consider the consequences of these environmental changes on health (See Figure 2). Health impacts can result from direct exposures to climate change through changing weather patterns (e.g., heat waves), or indirectly through changes

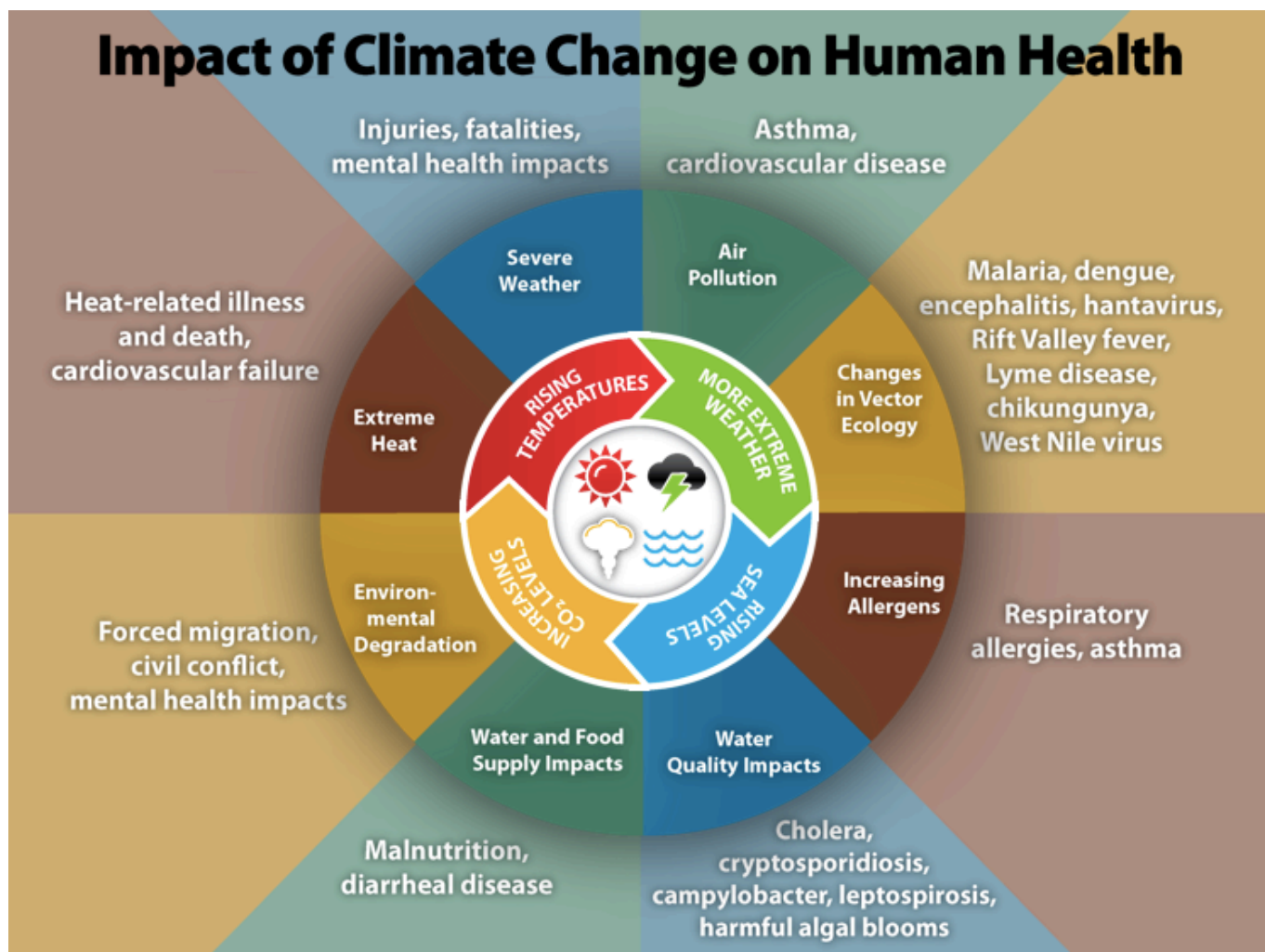


Figure 2: <https://www.cdc.gov/climateandhealth/effects/> Reproduced as part of public domain.

in water availability, air quality, and resultant changes in agriculture and the economy.

Regional climate changes are on the rise. In some locations, extreme precipitation events are becoming increasingly common such as the Northeast U.S., while in other areas droughts are more frequently experienced such as in the Southwest (Portier & Tart, 2010). The map from the National Aeronautics and Space Administration (NASA) (see Figure 3) shows a range of extreme weather events in the U.S. and costs associated with them. More data can be found at: <https://www.ncdc.noaa.gov/billions/events/US/1980-2018>. Health impacts should be considered based on these climate changes, which are regionally determined. These effects will continue to increase with advancing changes in climate.

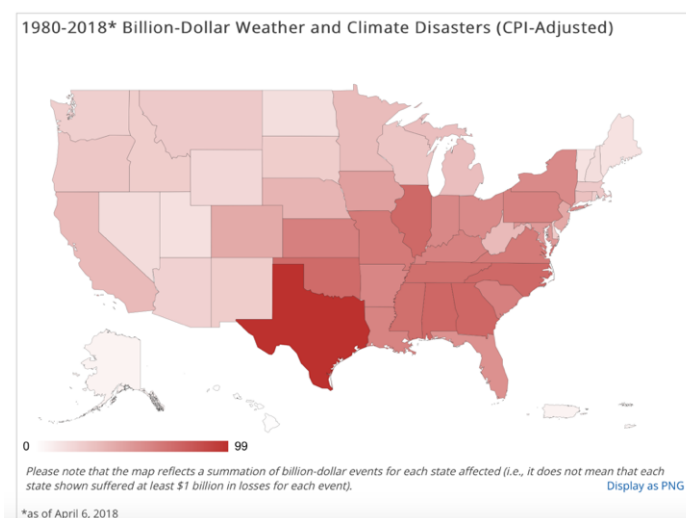


Figure 3

Unit VI: Climate Change

EXTREME HEAT

Average global temperatures are rising and are expected to continue to increase. The health impact of heat waves is an emerging environmental health concern. Health consequences of this global temperature rise include increasing rates of heat stress and exhaustion, heat cramps, heat stroke, and death. Heatwave events including the 2003 European event with 80,000 victims and the Russian event with approximately 54,000 fatalities have focused attention on the issue. With the anticipated increase in intensity and frequency of extremely hot weather events the impact on human health is expected to increase dramatically (Amengual et al., 2014). Heat-

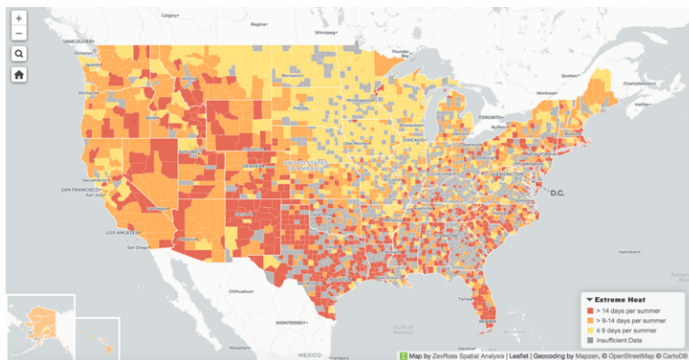


Figure 4

related mortality in U.S. cities is expected to more than double by the mid- to-late 21st century (Stone et al., 2014). In the U.S., extreme heat events already cause more deaths annually than all other extreme weather events combined (Portier and Tart, 2010). Much of the excess mortality from heat waves is concentrated in infants, children, and those with chronic illnesses and those over 65 (Amengual et al., 2014; Portier and Tart, 2010). Those living in urban environments are at added risk because of heat trapping materials used in the construction of roads and buildings (Diffenbach et al.,

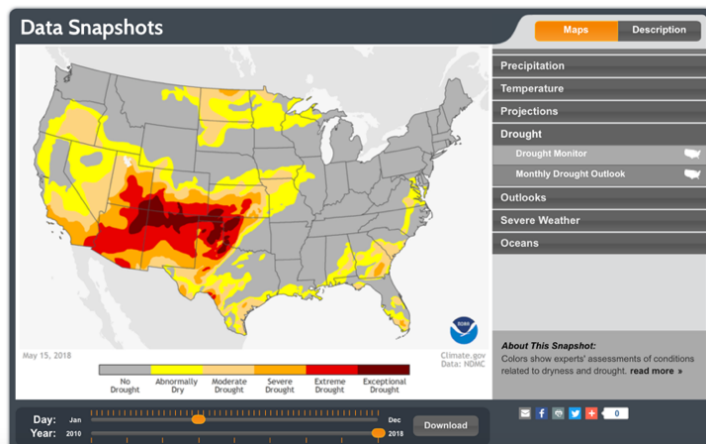


Figure 5

2017). Figure 4 is an interactive map that indicates extreme heat days by zip code. Visit at: <https://www.nrdc.org/climate-change-and-health-extreme-heat#/map>.

Additionally, cities lack significant tree cover, exacerbating the high temperatures. Cities frequently experience ambient air temperatures from 1.8–5.4°F (1–3°C) warmer than the surrounding rural and suburban areas. This “urban heat island” also absorbs heat during the daytime and radiates it outward at night, raising nighttime minimum temperatures by 22°F (12°C) (U.S. Environmental Protection Agency (USEPA), 2011a).

WATER SECURITY AND DROUGHT

Water security, or the reliable availability of water for drinking, agriculture, manufacturing, and many other uses, is essential to human health. However, floods and droughts that result from climate change can dramatically impact water availability and surface water quality (Delpla et al., 2009). In Southern U.S. states, droughts have become a more frequent occurrence; Western states have experienced water shortages worsened by reduced mountain snowpack attributable to global warming (Portier & Tart, 2010).

Figure 5 provides an interactive map from NASA that can be found at: <https://www.climate.gov/maps-data/data-snapshots/usdroughtmonitor-weekly-ndmc-2018-05-15?theme=Drought>. Reproduced as part of public domain.

Figure 6 shows national trends for Mean Temperature, Maximum Temperature, Minimum Temperature, and Precipitation for each month and season can be accessed using the form online: <https://www.ncdc.noaa.gov/temp->

Average Mean Temperature Trends, April

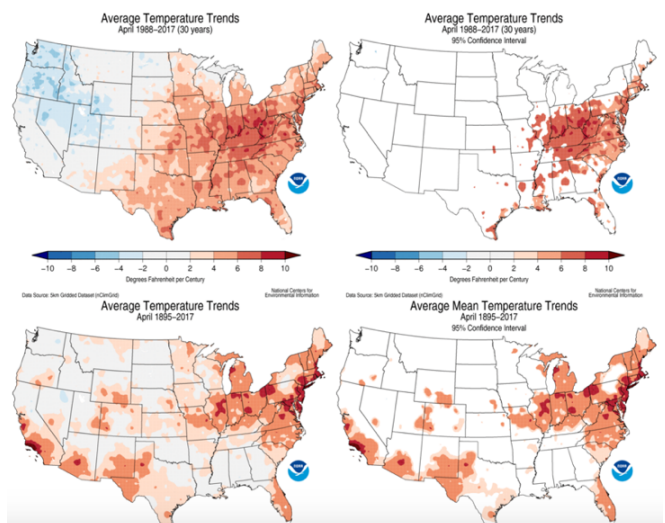


Figure 6

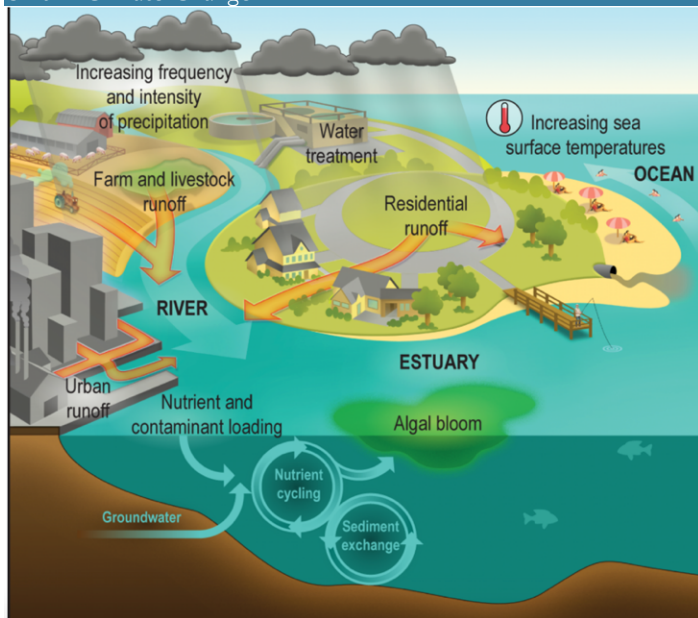


Figure 7: USGCRP (2016). See From <https://health2016.globalchange.gov/water-related-illness> Reproduced as part of public domain.

Precipitation and temperature changes affect fresh and marine water quantity and quality primarily through urban, rural, and agricultural runoff. This runoff in turn affects human exposure to water-related illnesses primarily through contamination of drinking water, recreational water, and fish and shellfish.

[and-precip/us-trends/](#). Reproduced as part of public domain. Maps are available that depict trends for the most recent complete 30-year period and the complete period of record. Each of those maps display the trend regardless of statistical significance as well as trends which exceed 95 percent confidence (trends which are not a result of random chance).

Figure 7 shows links between climate change, water quality and quantity, and water-related illness from: <https://health2016.globalchange.gov/water-related-illness>.

INSECT-BORNE DISEASES

Many major infectious disease agents (such as bacteria and viruses) and the vectors or organisms that carry them (e.g. mosquitoes, ticks, and fleas) are highly sensitive to temperature and rainfall. There is potential for climate change to impact the range and incidence of vector borne and zoonotic diseases which are influenced by the ecology of insects and on the life cycles of the disease-causing germs they carry (www.cdc.gov/ncezid). As environmental conditions change, the geographic range of the vectors for illnesses is extended, increasing the potential for infection. For example, as temperature increases, the malaria parasite reproduces at a higher rate and mosquitoes feed more frequently. Changes in

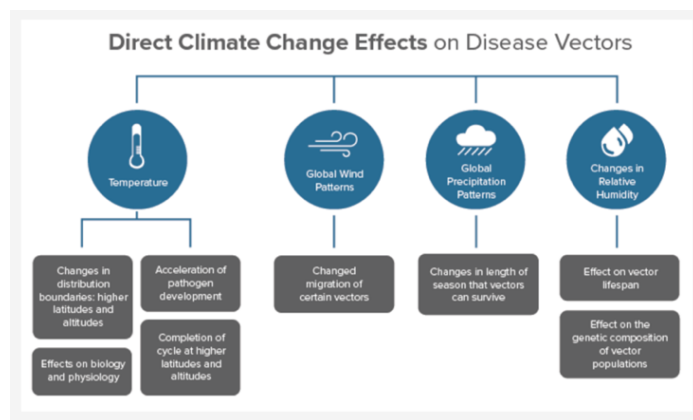


Figure 8

climate may make insect-borne diseases harder to control. There are established increases in geographical ranges of deer ticks, for example, that carry Lyme disease. Climate changes have contributed to the emergence of infections carried by mosquitoes like

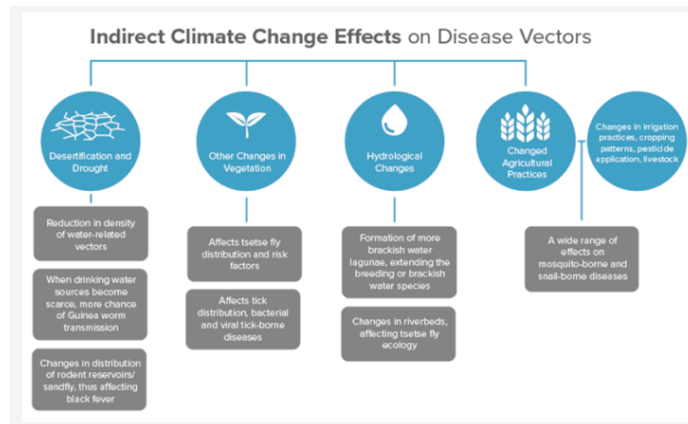


Figure 9

dengue, chikungunya and zika (Asad and Carpenter, 2018).

Figures 8 & 9 from Climate Nexus and the American Public Health Association (APHA) outline Direct and Indirect impacts on disease vectors: <https://climatenexus.org/climate-issues/health/climate-change-and-vector-borne-diseases/>

RESPIRATORY DISEASES AND PREMATURE DEATH

It is predicted that health impacts from climate change and ozone pollution in 2020 will result in significant increases in acute respiratory symptoms, asthma-related emergency room visits, weather-related hospital admissions for infants and older adults, lost school days, and premature deaths (Costello et al., 2011). Small changes in temperature (a degree or two) coincide with increasing ground-level ozone and, with it, a significant effect on death rates. An estimated 3,700 deaths annually

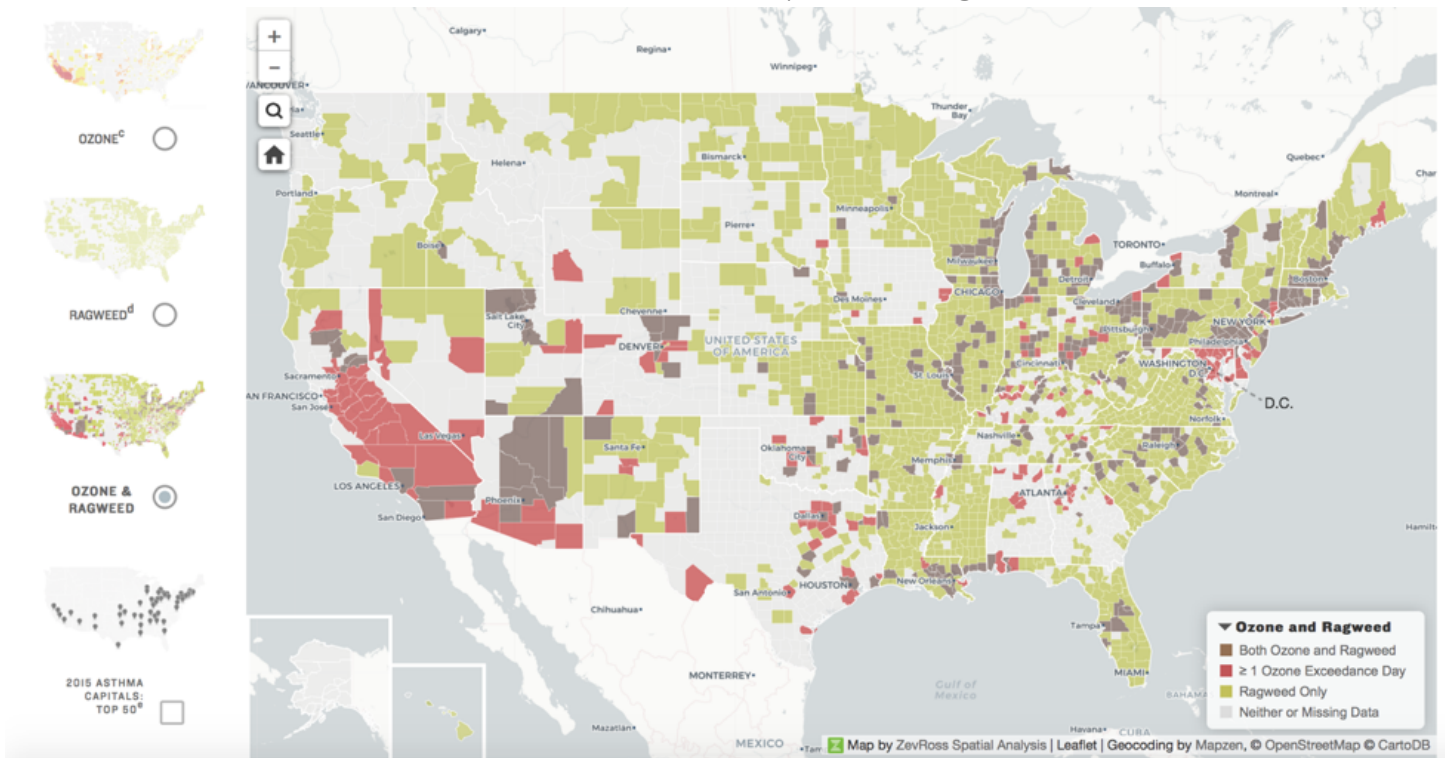


Figure 10: Visit interactive map at: <https://www.nrdc.org/climate-change-and-health-air-quality#/map> Reproduced as part of public domain.

(Perera & Sanford, 2011).

Climate change and resulting air pollution poses a serious threat to respiratory health. More than four in ten people live where the air is unhealthy (American Lung Association, 2018). There is now strong evidence linking changes in the seasonal pattern of allergenic pollen and excess death from heat waves. Global warming has caused an earlier onset of the spring pollen season in the Northern Hemisphere and increased the production of allergens (e.g., ragweed) (USGCRP, 2016). Temperature increases and increased carbon dioxide (CO₂) concentrations produce earlier flower blooming, affecting the timing and distribution of allergens such as pollen. It is anticipated that respiratory allergies and asthma will become more common and severe because of increased exposure to pollen, molds, and air pollution as a result of climate change



Aftermath of Hurricane Katrina - damage in New Orleans.
Credit: Laura Anderko

Figure 10 shows ozone and ragweed occurrence in the U.S.

MENTAL HEALTH AND WELLNESS

As climate change increases the frequency and ferocity of weather-related extremes is increasing. As a result, more people are being exposed, or even more tragically, the same people are exposed more with more frequency to personal injury, loss of their homes, income, environmental damage and even loss of lives.

All of this has profound, long-term impacts on mental health and wellness. The changing climate change will bring with it greater numbers who are exposed to extreme events and their sequelae and their subsequent psychological impacts including anxiety, depression, trauma, loss, grief and even suicide (Chalupka, Anderko, & Pennea, 2020; Burke, Sanson, & Van Hoom, 2018; Trombly, Chalupka & Anderko, 2017).

This conceptual design (Figure 11) illustrates the key pathways by which humans are exposed to health threats from climate drivers, and potential resulting mental health and well-being outcomes. The exposure pathways exist within the context of other factors that positively or negatively influence health outcomes (gray side boxes).