

Active living and population health in the era of climate crisis

March 5, 2020 [WellSpring](#)



[Share / Save](#)

Don't miss the next *WellSpring*. Subscribe to CAL's [Active Living E-News](#) to receive our monthly notice.

By **Eun-Young Lee**, PhD, **Shawn Hakimi**, PhD student, and **Evaline Zisis**, Undergraduate student, School of Kinesiology and Health Studies, Queen's University

Summary

Climate change has emerged as a global concern for population health that is expected to impact millions worldwide.

This WellSpring highlights the interconnected impact of climate change and human health and behaviours, including its relationship to physical activity and sedentary behaviours. It also provides practical information for practitioners to consider in their practice.

Introduction

Physical activity and non-communicable diseases

Non-communicable diseases (NCD) persist as a threat to global population health. In 2016, NCD accounted for 71% of all deaths, an estimated 41 million deaths worldwide.¹ **Physical inactivity (that is, not meeting the physical activity guidelines) is the fourth leading cause of NCD-related deaths.**

Figure 1a shows physical activity levels across seven different global regions. In this Figure, we observe that lower income countries tend to have more individuals who accumulate sufficient daily physical activity levels (to meet physical activity guidelines) compared to higher income countries.

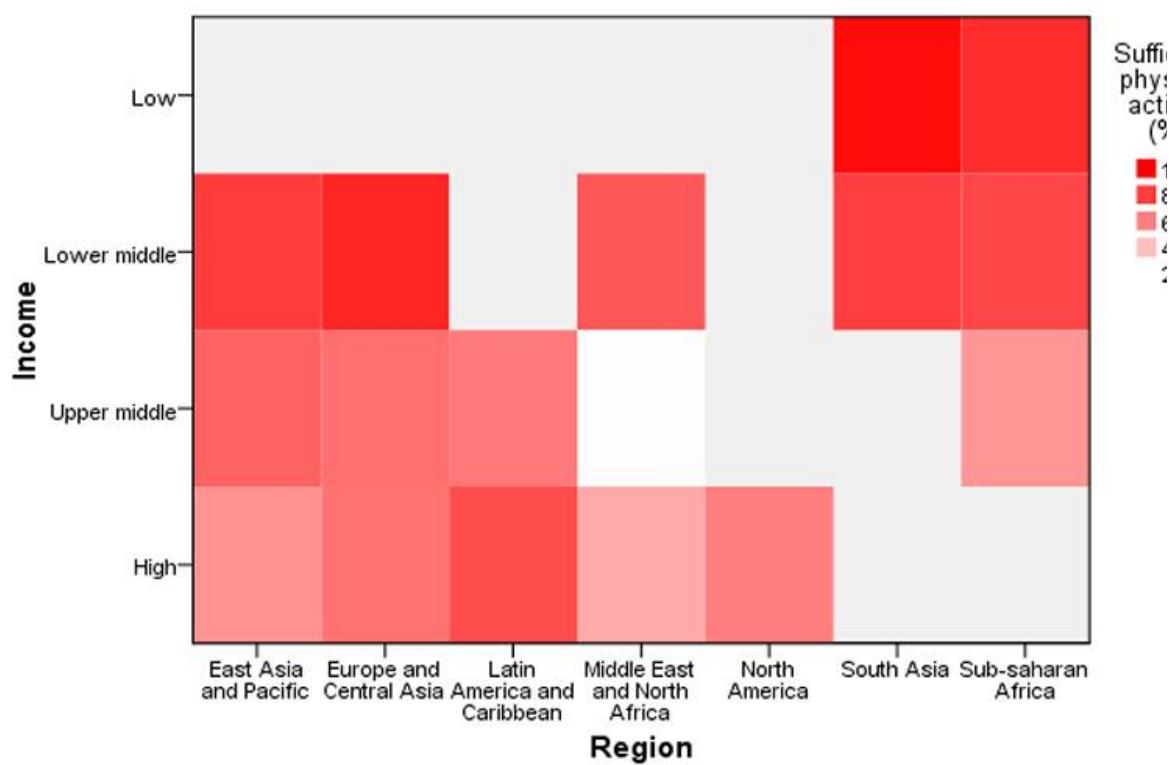


Figure 1a. Prevalence of sufficient physical activity among adults by region and income groups in 80 countries.

On the contrary, the death rate attributable to NCD is generally higher in high-income countries compared to low-income countries (Figure 1b). Human behaviour, such as physical activity, sedentary behaviour² and dietary habits,³ that occur in a 24-hour cycle have independent associations with NCD risk.

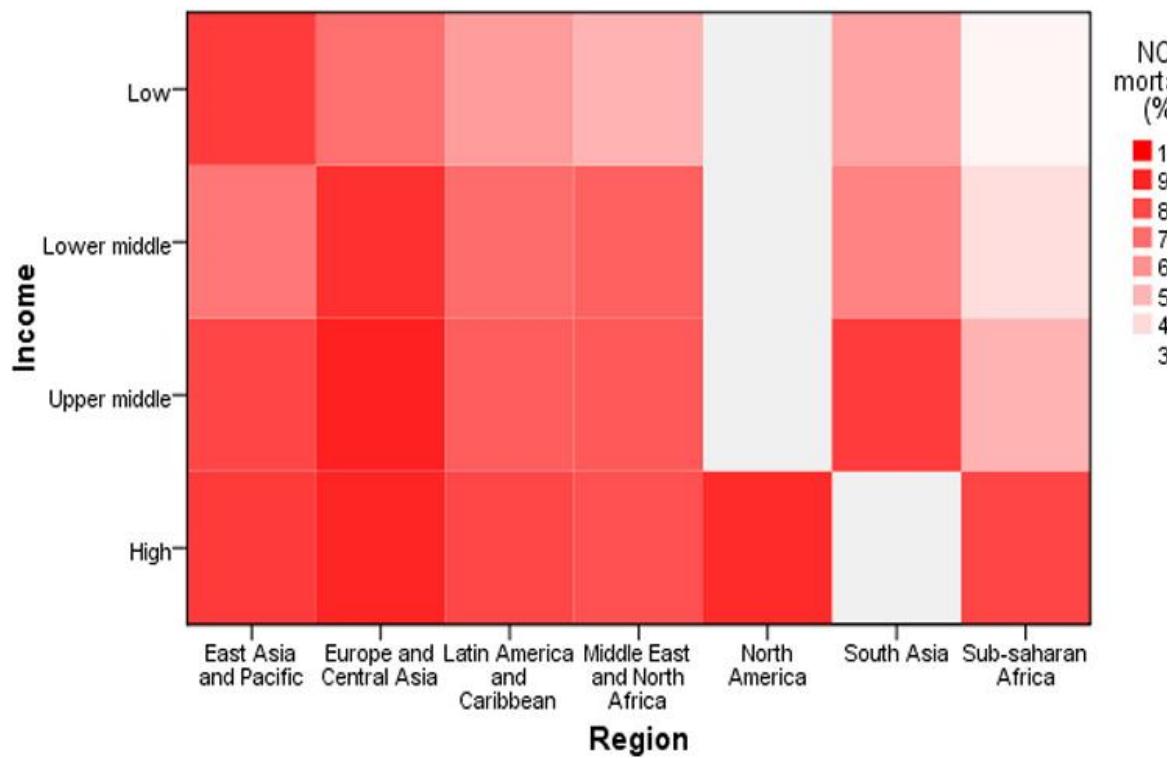


Figure 1b. Deaths attributable to non-communicable diseases (NCDs) by region and income groups in 227 countries.

Climate change and human health

In addition to NCD mortality, climate change constitutes a major challenge for achieving global population health.⁴ For many, a warming climate is expected to impact the availability of basic necessities such as fresh water, food, and energy.⁵ In the immediate future, allergies, heat stroke, depression and post-traumatic stress disorder, cardiovascular and respiratory diseases, and vector-borne diseases (i.e., illnesses caused by pathogens and parasites in human populations, such as Lyme disease) are expected to increase as a result.⁶

In 2019, the Canadian Public Health Association (CPHA) published a position statement outlining future recommendations and plans to tackle the impact of climate change on human health.⁶ CPHA emphasizes that the impact will continue to intensify if we do not mitigate greenhouse gas (GHG) (i.e., carbon dioxide) emissions drastically and immediately.^{6,7}

Many scientists and organizations suggest that **climate change mitigation and NCD prevention efforts must go hand-in-hand.**⁶⁻⁸ Therefore, strategies targeting both sustainability and human health should be developed for **dual benefits**, for example:

- Use public transit and active transportation (e.g., cycling and walking) instead of driving.
- Engage in different types of outdoor activities rather than spending time indoors in front of a screen.
- Consume diets rich in plant-based proteins.⁶

The importance of dual benefits is also highlighted by the 2018 Lancet Countdown, which notes that climate change is the greatest health threat of the 21st century but could also be the greatest health opportunity of our time.⁴

Climate crisis or health crisis?

The vicious cycle of climate change, human behaviour, and health

It is critical to understand the associations between the environment, human behaviour, and health, to develop strategies to achieve the dual benefits of climate change mitigation and NCD reduction. Figure 2 shows human behaviours that are associated with the environment include:

- physical activity,
- sedentary behaviour,
- dietary habits,
- consumer behaviour, and
- waste management at the individual level.

These human activities contribute to climatic features, such as temperature levels, precipitation levels and atmospheric contamination, but in turn may also be influenced by such climatic features.

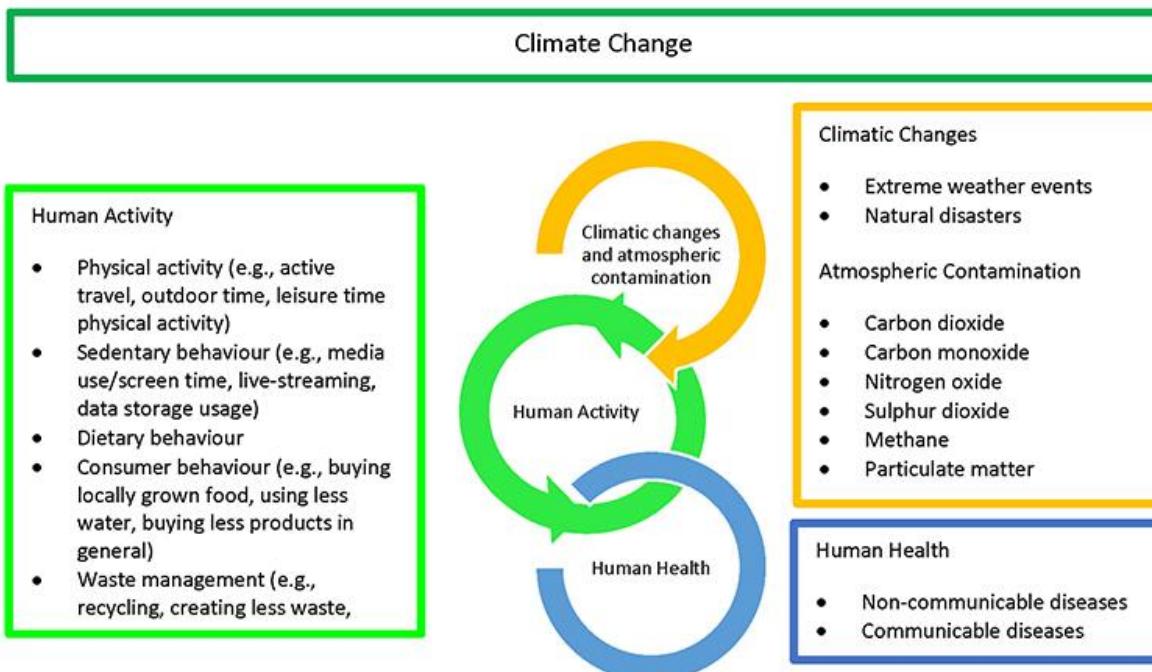


Figure 2. Links between climatic changes/atmospheric contamination, human activity, and health.

There is a **unanimous scientific consensus** that climate change is the consequence of human activity associated with industrial and economic development.⁹

Climate change exacerbates climate hazards, like air pollution, and continue to amplify the risk of extreme weather events and disasters.¹⁰ We are currently witnessing this with the **#AustralianBushFires** which have killed an estimated 33 people and more than a billion animals to date, with lingering damages ahead for many industries including tourism and agriculture.¹¹

The **impact on climatic features** from climate change include:

- more greenhouse gases,
- rising sea levels,
- poor air quality and air pollution,
- extreme weather events,
- substantial temperature variability,
- increasing allergens, and

- more disease vectors (illnesses transmitted by vectors, such as mosquitoes, ticks and fleas).

In turn, these changes have **implications on human health**, such as:

- restricting our ability to work,
- limiting our time spent outside,
- reducing our opportunities to be physically active outdoors.⁶



Carbon footprint

Today's modern lifestyle of powering Internet servers, charging personal devices, and using carbon-intensive media (e.g., live-streaming movies/music), along with the growing Information Technology sector, is estimated to have the same carbon footprint as the airplane industry and will **consume as much as 20% of the world's electricity by 2030.**¹²

Recent evidence on time-use epidemiology suggests that replacing screen time with physical activity or sleep is beneficial to health outcomes.¹³ Therefore, supporting individuals to adjust their daily activities with **behaviours that are less carbon-intensive and more physically active** will have a **dual positive contribution** to climate change mitigation and NCD reduction.

Data tell us the truth

A case study showing overlapping trends between greenhouse gas emissions, physical activity, access to electricity, and human health

To illustrate the importance of pursuing dual benefits, we conducted a case study using multiple secondary data sources, including the World Bank¹⁴ (224 countries) and the Global Observatory of Physical Activity (80 countries).¹⁵

Figure 3 illustrates that GHG emissions, access to electricity (as a proxy for carbon-intensive sedentary behaviour), and NCD mortality are generally high in high-income countries and decrease linearly along with country-level income status.

The reverse trend is observed with the prevalence of physical activity—physical activity levels are generally low in high-income countries and increase linearly as income status decreases.

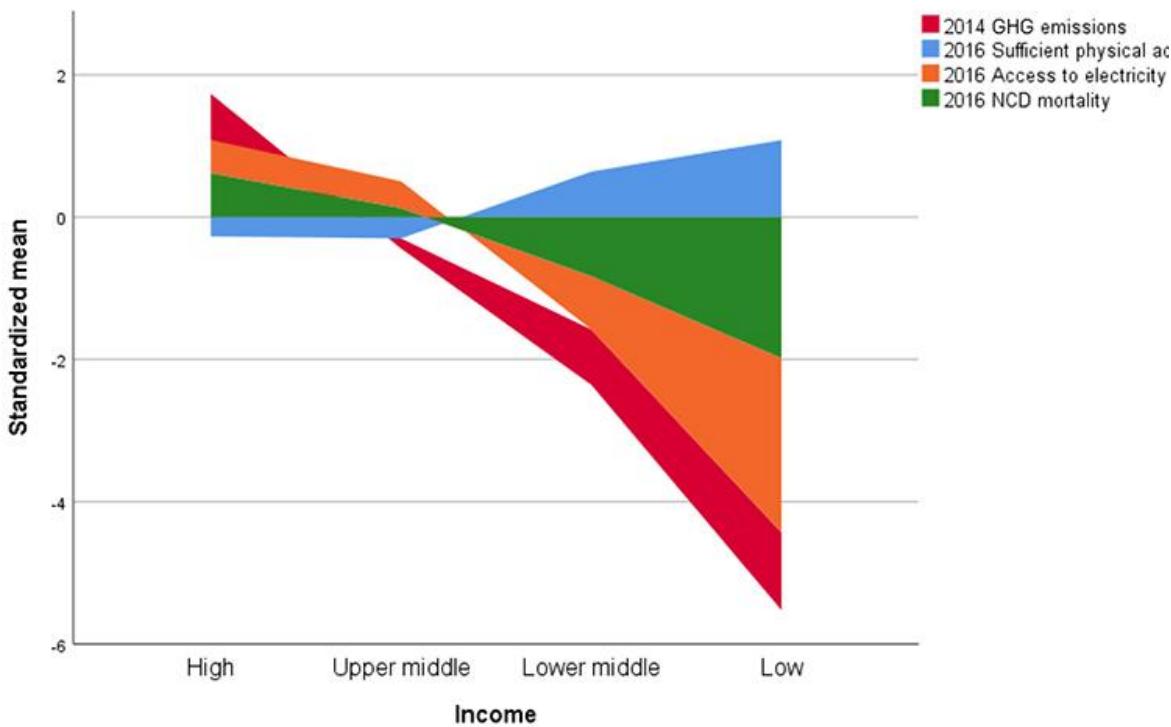


Figure 3. Stacked area standardized mean of GHG emissions, physical activity, access to electricity, and NCD mortality by World Bank Income groups in 80 countries.

This case study suggests that **high country-level income**, resulting from economic development and industrial processes, **is associated with high GHG emissions, low levels of physical activity, high levels of access to electricity, and, in turn, high NCD-related deaths worldwide.**

With increases in a country's income status, more individuals are able to afford new materials (e.g., fossil-fuelled vehicles, televisions, computers, and other electronic devices). Also, more access to electricity results in increased carbon-intensive, sedentary behaviours (e.g., sitting in a motorized vehicle or in front of a screen) and less time spent in the carbon-free outdoors and being physically active. These behavioural patterns undeniably and negatively impact human health.

Recommendations

Reframing behavioural modification strategies to achieve dual benefits

Radical changes in how we live, work, and consume must be made soon if we are to make a **10% relative reduction in physical inactivity by 2025**¹⁶ and **keep the global temperature increase to well below 2°C by 2050.**¹⁷

Several top-down action plans have been set out by the *Lancet* Commission including decarbonizing energy sources and creating cities that support healthy lifestyles for individuals.⁸

In Figure 4, we propose **bottom-up, small-scale action plans** with a particular focus on behavioural modification strategies consisting of physical activity and screen time/media use behaviour.

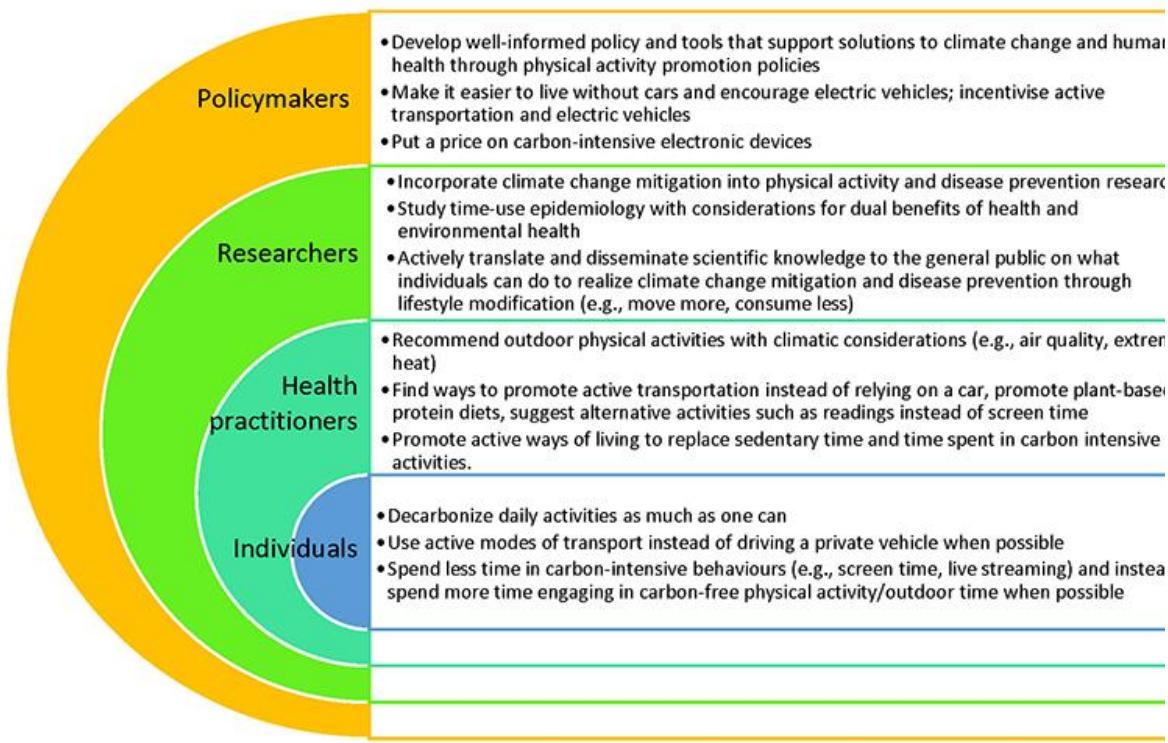


Figure 4. Practical recommendations for researchers, health practitioners, and individuals.

What individuals can do

To achieve dual benefits, individuals should aim to decarbonize their daily living as much as possible. For instance, choose to use active modes of transportation (e.g., walking and cycling instead of driving), and replace carbon-intensive behaviours (e.g., screen time and

live streaming) with carbon-free physical activity or outdoor time. These behavioural change strategies would contribute to obtaining the dual environmental and health benefits.

What health practitioners can do

Health practitioners can play a positive role by recommending outdoor physical activity with considerations on daily climatic features. Time spent outdoors should be generally encouraged at all times. However, alternative activities could be suggested for days with extreme heat or poor air quality, such as:

- exercising indoors using low-carbon intensive equipment,
- doing housework, or
- doing wholesome indoor activities such as reading, playing games, socializing, or cooking.

Health practitioners can also incorporate active lifestyle interventions and behavioural modification strategies into their own healthcare practices, such as:

- finding ways to promote active transportation instead of relying on a vehicle,
- promoting plant-based protein diets,
- suggesting alternative leisure activities such as reading instead of screen time, and
- promoting active ways of living to replace sedentary time and time spent in carbon-intensive activities.



What researchers can do

Finally, physical activity and health researchers should aim to incorporate climate change mitigation efforts into their physical activity and disease prevention research. This can be done by utilizing time-use epidemiology¹³ to determine ideal time-use behaviours that are advantageous for both human health and sustainability.

In addition, researchers should provide clear knowledge translation and dissemination for the public to inform individuals of what they can do to achieve dual-benefit activities.

Working together

Although mitigating climate change is a complex multi-faceted issue, there are opportunities where supporting increases in physical activity and reducing sedentary behaviour can jointly help NCD prevention and climate change mitigation. Multi-sectoral collaborations among researchers, practitioners, and policy-makers will play a key role in future efforts for both human health and sustainability in the era of climate change.

About the Authors

Eun-Young Lee, PhD, is an Assistant Professor in the School of Kinesiology and Health Studies at Queen's University. As the lead of the *In Situ Physical Activity Research lab*, Dr. Lee investigates social/environmental determinants and health consequences of movement behaviours.



Shawn Hakimi, MSc, is a first year PhD student in the In Situ Physical Activity Research Lab at Queen's University. His research focus is examining the links between a changing climate and human health.



Evaline Zisis, is a fourth-year undergraduate student and a research intern at the *In Situ Physical Activity Research Lab*. She is completing a Bachelor of Science Honours degree with a Specialization in Kinesiology at Queen's University.



References

1. Bennett JE, Stevens GA, Mathers CD, et al. [NCD countdown 2030: worldwide trends in non-communicable disease mortality and progress towards sustainable development goal target 3.4. *Lancet.* 2018;392\(10152\):1072-1088.](#)

2. Owen N, Salmon J, Koohsari MJ, Turrell G, Giles-Corti B. **Sedentary behaviour and health: mapping environmental and social contexts to underpin chronic disease prevention.** *Br J Sports Med.* 2014;48(3):174-177. doi: 10.1136/bjsports-2013-093107.
3. Cecchini M, Sassi F, Lauer JA, Lee YY, Guajardo-Barron V, Chisholm D. **Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness.** *Lancet.* 2010;376(9754):1775-1784. doi: 10.1016/S0140-6736(10)61514-0.
4. Watts N, Adger WN, Ayeb-Karlsson S, et al. **The Lancet countdown: tracking progress on health and climate change.** *Lancet.* 2017;389(10074):1151-1164. doi: 10.1016/S0140-6736(16)32124-9.
5. Haines A, Smith KR, Anderson D, et al. **Policies for accelerating access to clean energy, improving health, advancing development, and mitigating climate change.** *Lancet.* 2007;370(9594):1264-1281. doi: 10.1016/S0140-6736(07)61257-4.
6. Canadian Public Health Association. **Policy and position statement: Climate Change and Human Health.** <https://www.cpha.ca/climate-change-and-human-health>. Published October 2, 2019. Accessed February 27, 2020.
7. Intergovernmental Panel on Climate Change. **Fifth Assessment Report.** <https://www.ipcc.ch/assessment-report/ar5/>. Published October 2014. Accessed February 27, 2020.
8. Wang H, Horton R. **Tackling climate change: the greatest opportunity for global health.** *Lancet.* 2015;386(10006):1798-1799. doi: 10.1016/S0140-6736(15)60931-X.
9. McMichael AJ, Woodruff RE, Hales S. **Climate change and human health: present and future risks.** *Lancet.* 2006;367(9513):859-869. doi: 10.1016/S0140-6736(06)68079-3.
10. McCright AM, Marquart-Pyatt ST, Shwom RL, Brechin SR, Allen S. **Ideology, capitalism, and climate: explaining public views about climate change in the United States.** *Energy Research & Social Science.* 2016;21:180-189.

11. What you need to know about the australia bushfires. The Verge. February 13, 2020. <https://www.theverge.com/2020/1/3/21048891/australia-wildfires-koalas-climate-change-bushfires-deaths-animals-damage>. Accessed February 27, 2020.
12. Reality Check team. Climate change: Is your netflix habit bad for the environment? BBC News. October 12, 2018. <https://www.bbc.com/news/technology-45798523>. Accessed February 27, 2020.
13. Pedišić Ž, Dumuid D, S Olds T. Integrating sleep, sedentary behaviour, and physical activity research in the emerging field of time-use epidemiology: definitions, concepts, statistical methods, theoretical framework, and future directions. *Kinesiology: International journal of fundamental and applied kinesiology*. 2017;49(2.):252-269.
14. The World Bank. **World Development Indicators**. The World Bank. <http://datatopics.worldbank.org/world-development-indicators/>. Accessed February 27, 2020.
15. Global Observatory for Physical Activity. **Welcome to the Global Observatory for Physical Activity**. Global Observatory for Physical Activity. <http://www.globalphysicalactivityobservatory.com/>. Accessed February 27, 2020.
16. Guthold R, Stevens GA, Riley LM, Bull FC. Worldwide trends in insufficient physical activity from 2001 to 2016: A pooled analysis of 358 population-based surveys with 1.9 million participants. *Lancet Glob Health*. 2018;6(10):e1077-e1086. doi: 10.1016/S2214-109X(18)30357-7.
17. United Nations. **Adoption of the Paris Agreement: Report of the Conference of the Parties**. <https://unfccc.int/resource/docs/2015/cop21/eng/I09r01.pdf>. Published December 12, 2015. Accessed February 27, 2020.