

1 Popular science summary

The health risks when the climate is changing in Taiwan

Is the risk of dying in heart failure the same all year around? Diseases occur with varying frequency throughout the year. To be able to prevent them from happening, it is important to be able to predict when they will happen and under what circumstances. Climate change is making extreme weather events more common, which could increase the occurrence of some health conditions. In this study, different ways of predicting the weather and how the weather is affecting the health in Taiwan have been investigated.

Every year, many people die from different illnesses that are to some extent related to the atmospheric conditions around us. The human body is vulnerable to extreme environmental conditions such as high or low temperatures and intense sunlight. Some atmospheric conditions such as radiation from the sun may not be noticed in a short-term perspective but are presented much later as for example skin cancer. Other atmospheric conditions such as temperature can have more acute effects which can become life threatening if ignored. To be able to prevent such awful events it is important to predict when they will occur. In this study, a climate phenomenon called El Niño Southern Oscillation(ENSO) was used to try predicting when hot conditions that can cause disease may occur in Taiwan. ENSO is affecting the climate in the Pacific region. It also influences the climate in the whole world to some extension. ENSO drives the global weather and can be forecasted with 6-12 month lead time. Understanding the link between ENSO and extreme weather provides an opportunity to develop early warning systems. Also, a climate index called the Universal Thermal Climate Index(UTCI) was used to predict how likely different diseases are to occur. UTCI is like temperature, but it is integrated with several atmospheric variables and can therefore better predict how the body will be affected. This is because temperature is not the only variable affecting the human body's response to heat. What is hot also depends on how easily our bodies can get rid of heat. Imagine lying under a thick blanket or doing intense exercise. You will be rather warm without the temperature in the room necessarily being particularly high. The blanket is trapping heat under it. It is the same with conditions in the atmosphere. For example, if it is humid outside little heat can be lost through sweating as water will not evaporate as easily as on a dry day. The humid day may be perceived as warmer than the dry day even though the temperature was the same both days. This is where UTCI comes in handy as it is a representation of how the body will respond to the atmospheric conditions, in a more accurate and complete way than temperature.

So, what was found in the study? First, it seems that ENSO can be used to predict high temperatures in specific locations during specific seasons. In the south and mid-western parts of Taiwan there seems to be a positive relation between temperature and ENSO index in the summer, meaning that higher values of the ENSO index give higher temperature. Also, it seems that diseases related to the heart and circulatory system are more sensitive to cold conditions in Taiwan. Therefore, these kinds of diseases will increase when the weather is unusually cold. In south Taiwan the diseases related to the heart and circulatory system are sensitive to heat stress as well. Diseases that are related to heat stress directly seem, as one would expect, to increase when it is hot outside. However, these diseases occur rarely to begin with. The climate is complex, and it is tricky to predict the weather. UTCI is a useful tool that can make it easier to determine if the atmospheric conditions will be dangerous. It is important to continue working with these issues to better be able to prevent diseases from happening. As cold stress was found to affect the number of cases of the diseases related to the heart and circulatory system, an interesting direction continued studies look at is how ENSO can be used to predict when temperatures will be unusually cold. Also, some individuals could be particularly sensitive to high minimum temperatures which could also be an interesting continuation of this study.