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Concepts in Climate Change & Public Health

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Wildfires are an ongoing serious concern facing New Mexico forests, wildlife, and residents on an annual basis. According to Mueller et al. (2020) the Southwest United States has seen an increase in wildfires, their size and intensity, which is increasing the damage to the ecosystems involved in and surrounding those fires. This statistic is particularly troubling because the entire Southwest is at risk for increasing dangers related to wildfire. The article goes on to discuss some of the environmental factors leading to the increase in fires and fire danger. It appears that wildfires are a multi-leveled problem beginning with other climate change factors. According to Margolis et al. (2017) the Southwest is experiencing this increase in wildfire and severity due to climate change factors including increasing temperatures, drought, and early snow melt. Over the years we have seen a steady increase in both summer and winter temperatures leading to ongoing drought, when coupled with a decrease in rain and snow fall annually has primed our forests for disaster.

Wildfires may be a byproduct of the climate change however it has a cyclical effect on the factors affecting them. There are many negative environmental factors stemming from wildfire such as loss of forestation/vegetation, carbon emissions increasing greenhouse gasses, loss of habitat both animal and human, and death. The factors we don't see however may be the most unsettling in relation to climate change. Small forest fires can be rejuvenating and stimulate new growth along forest floors, this is not the case when dealing with large scale forest destroying fires. When a forest fire destroys acres upon acres of underbrush and trees there is a great deal of damage done crippling the forest for decades to follow. According to Liang et al (2017) the destruction of large forested areas decreases that areas carbon carrying capacity. Carbon carrying capacity is the ability of an eco-system to sequester and store carbon gasses for ground soil regeneration. A decrease in carbon carrying capacity then leads to decreased tree

regeneration, resulting in anywhere from a 6 to 73% decrease in forested areas (Liang et al. 2017). This then has a cascading effect on future climate and fires concerns. With less forested areas to take up greenhouse gases we begin to see an increase in temperatures and droughts, and a decrease in rainfall and snowpack thereby leading to conditions which make wildfires easier to start and harder to maintain.

Wildfires have a huge impact on climate change and climate change has a huge impact on wildfires. If we take for example the Cerro Grande forest fire that devastated the Los Alamos areas in May 2000, we can see the long term disastrous effects of fire. To this day the forest has not fully recovered leaving large areas of burned out trees which have still not begun to regrow, and we are twenty years from when that fire took place. I think it is safe to say that the effects of that fire will continue to be seen for at least another 20 years from today. As long as we continue to see climbing summer and winter temperatures, decreases rain and snow fall we should expect fires to be a concern for easily the next 10 – 20 years in the future. If we begin to take an active role in the safety of our forests, we may be able to decrease the risks and likelihood of catastrophic fires.

Climate change has a significant impact on our eco-system and our daily lives, but one area many people ignore is the health impact of individuals whom have varying health problems due to the shifts in climate. One huge drive for health risk due to climate change is drought. Drought is responsible for the increase in wild fire risk; therefore, it is important to understand the health risk associated with drought so we can understand how they contribute to wildfire. Drought is responsible for a myriad of health conditions due to an increase in temperatures, decrease in rainfall, and an overall shortage of available water. This is especially troublesome for high risk populations and puts them at greater risk for drought related illnesses. With limited

access to water children and elderly face increased risk for dehydration which can lead to cognitive problems, kidney problems, and even death. There are other risks associated with drought that affect everyone. Less water will lead us to drought and that means there is increased risk for food loss due. According to Ebi et al. (2016) the increase in drought and scarcity of food has health impacts that include stress, mental illness, worsening chronic diseases, and undernourishment. While less rain may seem to have a small impact on our health the long term repercussions of drought have a significant long term impact on everyone's health and wellbeing.

Drought and decreased rainfall have an impact on the number of wildfires we experience annually, which in turn leads to a number of health problems associated with wildfires. Smoke inhalation due to wildfire has extremely significant effects to health and wellbeing. Wildfire smoke contains numerous hazardous air pollutants and have documented health effects from exposure to them (Reid et al., 2016). Wildfire smoke has shown to affect individuals who suffer from respiratory health problems. This specifically includes people who suffer with asthma, chronic obstructive pulmonary disease, and increasing evidence is showing cardiovascular problems. Increased smoke inhalation has also show to increase certain types of respiratory infection. Increases in smoke inhalation can exacerbate any of these problems and prolonged exposure can lead to death. Wildfire also have many damaging effects on the environment surrounding the area affected by fire. This can impact things such as growing ability for farmed land. With a decrease in forestation there is a decrease in carbon replenishment in ground soil which also decreases farmable land. This creates a cyclical problem with food scarcity and security leading to additional medical concerns. Individual will experience malnourishment as well as psychological impact of food scarcity. According to Reisen et al. (2015) wildfire activity

is predicted to increase with global climate change which will lead to longer fire seasons and larger areas of burn. There are many side effects of wildfire we are still unsure of due to the unknown chemical properties of smoke. Wildfire smoke is a complex mixture of pollutants that can undergo chemical and physical changes whose health risks are still unknown due to the complexity of the smoke (Reisen et al. 2015). So as you can see wildfire and drought are very complex multifaceted problems that have significant health impacts among many different medical areas.

Preparing for climate change related disasters are have a very complex dynamic. When addressing the negative results of climate change we need to look towards emergency preparedness, targeting specific side effects from climate change. Wildfires has devastating effects on communities, and current methods of preparedness and intervention leave room for improvement. According to Ismail-Zadeh (2016) if we begin to take a scientific approach to disaster preparedness and response we can expect to see a decrease in the number of instances of disaster, their intensity, and the impact they have on the communities surrounding them. Taking this type of approach has a very strategic mindset geared towards planning and development as well as a strong focus on education and prevention. Through proper planning and development communities will address problems with urban sprawl in areas that are considered high risk fire zones. This assessment will include inspection of building material and structural styles to identify problem areas that populations inhabit. By doing so we can identify areas of high concern and people who are at most risk for wildfire related injury.

With changes in climate and increases in annual droughts wildfire danger and risk continues to grow. One primary goal of prevention is mitigation of risk and this has to start with

people living in the communities most affected. A change in the way we communicate and educate individuals in high risk area needs to be made. In the past we have tried to just inform people of what they should do to prepare and that they are in high risk areas. This is show to work moderately well however a more effective approach is available. The communication of social norms, and what others are doing or think should be done, has been found to be more effective as a behavior modification strategy (Howe, et al. 2018). If we understand what our neighbors are doing and have done to prepare for wildfire, we are more likely to prepare in a similar manner. This allows for more consistency of education and preparedness because it is one unified shared message.

Response may be one of the most critical aspects in dealing with wildfire. Early effective response can have a cascade of positive effects. With early, effective, and quick responses we can decrease the risk associated with living in higher risk areas, which in turn decreases the risk of suffering from wildfire related illness and or injury. A heavy burden for response falls on our disaster responders or first responders. It is critical to ensure we have the right people in those positions because those who are poorly trained, unqualified, and unsuited for the work can diminish the effectiveness of a successful response (Wright, et al. 2018). That is why it is important to work as a community to select the right individuals representing the public in emergency response capacities. Effective response can help reduce the negative effects of wildfire but in the instances injury occurs, we need to ensure our health systems are well prepared and equipped to deal with fire related injury. This falls back to ensure we are prepared in our hospital and health systems to manage wildfire health effects. This leaves hope for our communities, because if we work together with one focus and goal in mind, we can minimize risk and better our outcomes.

Wildfire is an ongoing problem stemming from increases in temperatures, decreases in rainfall, and prolonged drought. Climate change is widely responsible for these factors, and if we act now we can still minimize, and mitigate some of the effects from climate change. As a community we need to look towards our forests and vegetation for repair. Deforestation has a major impact on climate change causing an increase in green house gases which lead to an increase in temperatures. With increase in temperature droughts persist leading to more areas at risk for wildfire. Our forests aid in repairing soil, by injecting needed nutrients for regeneration as well as helping to prevent ground water from flowing away from vital area (Pecingina, 2018). This creates a cyclical problem where forests cannot successfully regenerate themselves making it harder for forests to contribute to the recovery of our planet. This means our communities need to take action and do our part to help replenish and replace what we have taken. Communities need to band together and participate in mass scale replanting efforts to help build our forests up. This is a long term plan that will begin to reap early benefits with new growth providing a filtration for CO2 emissions while strengthening the integrity of the forest.

As a population we need to begin the rapid decrease in CO2 and other pollutants. As communities we must take action to reduce our individual carbon footprint to help reduce the amount of greenhouse gases affecting our planet. Greenhouse gases are responsible for the rise in surface temperature, and if we can play a role in decreasing this, we must. Many actions can be taken in the effort to combat greenhouse gases. Eating meats has a much larger environmental impact than a more plant based diet so experts recommend reducing or eliminating meat intake (Albeck-Ripka, n.d). Another big contributor to greenhouse emissions is most of our means of travel. If we could reduce the number of flights we take and the miles we

drive we will have a direct impact on emissions polluting the air. Lastly one of the largest contributors to greenhouse emissions is the production and use of concrete. Concrete emits close to a one to one ratio of emissions to finished products. Concrete production single handedly accounts for 7 percent of carbon emissions, making it the second largest industrial emitter in the world (Harvey, 2018). If we can make a radical shift in the building materials we use for homes, building, and walkways we can drastically reduce carbon emissions overnight.

There is no easy fix to managing and dealing with the effects of wilding fire, and fixing our climate problems will require time, patience and a lot of hard work. With the participation of communities we can begin to make a difference in the world. It will take the participation and cooperation of individuals, communities, organizations, and governments as a whole. One of the most important takeaways that can come from this is action, we need to take what action we are able to no matter how big or small, because without action we will never see change.

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