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Community and Health Impacts of Diminishing Water Supplies due to Climate Change in Southern New Mexico

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Title

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Introduction/Background

New Mexico is the sixth-fastest-warming state in the nation. The average annual temperature has increased about 2.7ºF since 1970 (Union of Concerned Scientists, 2016). This implies earlier spring, hotter summers, and less predictable winters. Precipitation patterns are also changing, which means; more intense drought, increased intensity of rainstorms, a greater proportion of precipitation falling as rain rather than snow, more frequent and severe heat waves, increasing temperatures, shrinking water resources. Shrunken snow-packs and earlier snowmelts contribute to lower stream flow at critical times of the year and this reduced availability of water has greater economic and environmental consequences. New Mexico is found in the Southwest region of the United States. This region is already the hottest and driest region in the nation (USGCRP, 2014). This Southwest region extends from the Pacific Ocean east to the Rocky Mountains and south to the Mexican border. This region is home to about 56 million people, about 90% of whom live in cities, including Albuquerque. Climate change is affecting the Southwest more intensely than other areas of the country. Temperatures have increased by almost 2°F in the last century, in fact, the 2001-2010 decade was the warmest decade since records began 110 years ago (USGCRP, 2014). Drought conditions are already common in the Southwest and these

drought periods are expected to become more frequent, intense, and longer. Drought will affect important water sources, including the Colorado River Basin and the Rio Grande River. The purpose of this paper is to present a description of a critical climate change issue in New Mexico, to review the expected health impacts if this on a community or population in New Mexico, present a description of a community health approach using the Public Health Preparedness Framework and to describe what recovery and resilience could look like.

Part 1. Description of Critical Climate Change issue in New Mexico.

One of the critical climate change issues that is impacting the lives of New Mexicans particularly the Southern New Mexico residents now and in the future, include: Decrease water supply. Water is the primary medium through which the New Mexican people will experience the effects of climate change. Water resources are important to both the society and ecosystems in New Mexico. The population depend on a reliable, clean supply of drinking water to sustain their health. The residents also need water for agriculture, energy production, navigation, recreation, and manufacturing. Many of these uses put pressure on water resources, stresses that are more likely to be exacerbated by climate change. In many areas such as in the Southern part of New Mexico, climate change is likely to increase water demand while shrinking water supplies. This shifting balance would challenge water managers to gradually meet the need of growing communities, sensitive ecosystems, farmers, ranchers, energy producers, and manufacturers. The severity and length of droughts; this has been especially of concern in the southern part of New Mexico. Droughts are making the water scarcity worse in this area and thereby negatively impacting people's health and productivity. New Mexico is already dried out with heat, with many areas of the state receiving less than 15inches of precipitation over the entire year. According to the Union

of Concerned Scientists, changing precipitation patterns in the state due to climate change are expected to result in "more intense drought and a greater proportion of precipitation falling as rain rather than snow." Both trends have serious implications for water security across New Mexico. Climate change is altering fundamental weather patterns thereby affecting temperatures and water availability that shape the lives of New Mexicans. Climate change is happening now and its effects, especially the Southern part of New Mexico, can be felt every day. Regionally, climate scientists say increasing temperatures, and changes in precipitation in New Mexico and throughout the Southwest, decrease the amount of snow runoff that flows into river basins like the Rio Grande, affecting the area's water supply as less snow at higher elevations has serious implications for managing water resources. So, one of the things people have seen in New Mexico is because we have a longer snow-free season and because we have higher temperatures.

Part 2. Description of the Expected Health Impacts on a Community or Population in New Mexico.

The impacts of climate change include warming temperatures, changes in precipitation, increases in the frequency or intensity of some extreme weather events, and rising sea levels. These impacts of climate change threaten the health of the people in New Mexico by affecting the water we drink, the food we eat, the air we breathe, and the weather we experience. More so, the changing climate impacts the New Mexico society and ecosystem in a wide variety of ways: For example, climate change can alter rainfall, influence crop yields, affect human health, cause changes to forests and other ecosystems, and even impact our energy supply too which could be dangerous to the people who live now and to the future population. Therefore, ensuring **t**hat everyone has access to

sustainable water services in New Mexico is a critical climate change mitigation strategy for the years ahead.

Mental and behavioral health implications play a very vital role because any changes in a person's physical health or surrounding environment can also have serious impacts on their mental health. Experiencing an extreme weather event can cause stress and other mental health consequences, particularly when a person loses their home, etc. (USGCRP, 2016). Persons who rely on water for their economic livelihood (e.g., farmers, ranchers, landscapers, horticulturalists, recreational facility operators) and persons who have anxiety or depressive disorders

Moreover, some populations are especially vulnerable top climate health risks due to sensitivities, high likelihood of exposure, low adaptive capacity, or combinations of these factors. Older adults are vulnerable to many of the impacts of climate change. Other health impacts exist between climate change and human health. For example, dehydration because of changes in temperature and precipitation, as well as droughts, will affect agricultural yields and production, rodents, and fish's lives (USDA 2015).

Agriculture is one of the biggest utilizations of water versus residential water use. And so, with that we are going to have a harder time watering our crops and keeping up with production as we have in the past, Roemer (2018) said. "So, we have to come up with strategies to deal with the potential for these types of long-term droughts and extreme temperatures." Although the impacts of climate change have the potential to affect human health in Southern New Mexico residents and around the state, Garfin (2018) said there are many ways people can reduce their carbon footprints now, like installing renewable energy sources in their homes and switching to cleaner modes of transportation, there is a lot we can do to prepare for and adapt to these changes such as

establishing early warning systems for heat waves and other extreme events, taking steps to reduce vulnerabilities among population of concern, raising awareness among healthcare professional, and ensuring that infrastructure is built to accommodate anticipated future changes in climate. The impacts of climate change on water availability and water quality has affected many other sectors, including human health; people can become ill if exposed to contaminated drinking or recreational water. Climate change increases the risk of illness through increasing temperature, more frequent heavy rains and runoff, and the effects of storms CCSP (2008). Some health impacts may include gastrointestinal illness like diarrhea, effects on the body's respiratory systems, or liver and kidney damage CCSP (2008). In addition, naturally, climate change affects more than humans. Dr. Gary Roemer is a professor in NMSU's fish, wildlife, and conservation ecology department. Roemer (2018) said drought and increased land-surface temperatures due to climate change have impacted his studies on rodents like prairie dogs and banner-tailed kangaroo rats. In some parts of the state like the southern New Mexico residents, these impacts may compromise food security and threaten human health through malnutrition, spread of infectious diseases, and food poisoning. The worst of these effects are projected to occur in poor communities, among vulnerable populations.

Regionally, climate scientists say increasing temperatures in New Mexico and throughout the Southwest decrease the amount of snow runoff that flows into river basins like the Rio Grande, affecting the area's water supply. The Southern New Mexico residents rely on the surface water coming from Colorado, coming down and we like it to melt at a certain time and then fill our reservoirs you know all the way from Colorado all the way down to Elephant Butte and Caballo and climate change is actually changing the way that happens and there's actually less water coming down," DuBois (2018) said. "So, it's not only the timing but also the amount of water is

decreasing." Moreover, one of the things we have seen throughout the Southwest and in New Mexico as well is because these arear have a longer snow-free season and because we have higher temperatures. Therefore, understanding the threats that climate change poses to human health is the first step in working together to lower risks and be prepared.

Part 3. Description of a Community Health Approach using the Public Health Preparedness Framework.

What is /or will be needed to be prepared for the adverse impacts to reduced water supplies, increased periods of heat, shorter winters, and drought.

Preparedness and Mitigation frameworks: Public Health Activities for Pre- and Early-stage Drought Conditions.

1). Conduct an Internal Capacity Assessment.

An essential part of drought mitigation is ensuring that resources are in place to prevent and minimize adverse health effects to the community should they occur. To facilitate efficient and effective response, the community should conduct internal capacity assessments either before drought occurs or at the early onset of drought conditions. The goal of the capacity assessment should be to identify where needed resources can be obtained for specific drought-related public health action.

2). Conduct a Public Health Vulnerability Assessment.

One of the first drought preparedness steps that should be undertaken by any health department is to conduct a public health vulnerability assessment. This type of vulnerability assessment can be used to determine both the populations most likely to be disproportionately affected by drought-related adverse health effects and the types of

drought-related problems most likely to be encountered within a community. These populations and implications can vary widely between jurisdictions. For instance, because people who live in rural areas are more likely to obtain drinking water from private water sources rather than through municipal water systems, health departments serving rural communities would need to identify households relying on water from shallow wells as being more vulnerable to the negative health effects associated with drought. Identifying these types of vulnerabilities is a key step toward ensuring drought readiness. In addition, data should be used, if available, to determine how water is used in the community and which sectors (e.g., agriculture and residential) are primary users of water resources. For example, significant amounts of water may be used for agricultural purposes in some rural areas, but residential, use may be more prevalent in some urban and suburban areas. Knowing this information both before and during drought can assist in planning and making decisions during drought preparedness and response.

3). Identify and Coordinate with Key Partners and Stakeholders in Drought Efforts.

To ensure optimal public health preparedness during the early stages of drought, public health professionals working in federal, state, and local agencies must identify and continually collaborate with partners and stakeholders in other sectors and disciplines who are working to reach similar objectives. Numerous entities are involved in drought preparedness and include representatives from governmental agencies, various associations and organizations, and private industry.

4). Communicate Drought Strategies and Recommendations.

Communication is an essential component of drought-related public health efforts. An effective communication plan includes establishing a communication objective, identifying audiences, and developing messages aimed at achieving the desired response.

5). Educate and Train Key Partners.

Education and training are crucial parts of the overall effort to ensure effective and consistent communication with key partners in drought preparedness and response. In coordination with other agencies and organizations that have roles and responsibilities in disaster response and water-related issues (such as those in the water supply, treatment, and distribution sectors; companies responsible for water sanitation; and health care organizations), public health departments should engage in educational and training activities to ensure that key partners understand the public health implications of drought and the ways to mitigate adverse drought-related public health outcomes. Likewise, these professionals should be encouraged to attend educational and training sessions sponsored by water-sector partners within their communities.

Response framework: Public Health Activities for Late-stage, Severe Drought Conditions

Ideally, public health departments should engage in preparedness activities before drought severely affects their communities. Also, important to ensuring the health of a community, however, is an effective public health response. Examples of threatening conditions include times when a community has no water for drinking or sanitation, when local water supplies have become contaminated and linked to adverse health outcomes, and when drought results in socioeconomic collapse or social disruption.

1). Evaluate Drought-related Impacts on Public Health.

One of the first steps in responding to drought-related public health threats is to conduct an evaluation of the way drought-related conditions are currently impacting or will impact the population's health. This effort also includes anticipating any future health effects. When conditions suggest that a drought may be imminent, public health professionals should identify the populations that are most affected by an adverse condition. For instance, immunocompromised persons drinking contaminated well water could be at increased risk for adverse health outcomes, firefighters may experience increases in wildfires in the face of a diminished supply of surface water, and people swimming and boating in lakes and rivers containing dangerously low water levels would have an increased likelihood for injury.

2). Coordinate Drought Response Activities with Key Stakeholders and Partners.

Once the drought-related public health impacts are determined, as a public health professional I should contact the key stakeholders and partners identified as part of their drought preparedness activities. The professional should be informed about the public health threats affecting my communities and should serve as collaborators in efforts to mitigate adverse public health implications.

3). Develop Health Response Objectives and an Action Plan, and Communicate These to Involved Partners

Addressing any public health threat requires the development of health response objectives that are achievable, measurable, and specific. These objectives also should be assigned certain timeframes. Once these objectives have been defined

and prioritized, action plans should be developed within the scope of a health department's available resources and assets. If sufficient resources and assets are not available to address identified public health threats during drought, mechanisms for such capacity must be considered, such as mutual aid agreements. Because drought affects so many facets of life and varying populations, it is important to communicate any drought-related response objectives and action plans to key stakeholders and partners to minimize conflicts of interest, streamline efforts, and maximize outcomes.

4). Assign and Use Resources to Achieve Drought Response Objectives.

After response objectives are identified, available resources should be allocated depending on the priority that has been assigned to each response activity. Resources can include both internal assets, such as monetary funds, health department personnel, surveillance tools, and communication tools, and those that are acquired outside of the health department, like support through existing mutual aid agreements, health care facility capacity, additional nonmunicipal water supplies, and water-safety-related equipment and tools. Because many defined drought response objectives cannot be achieved within the immediate response period, effective resource allocation is needed to ensure that public health response activities remain in place if they are needed.

5). Address Requests for Assistance and Information

Drought affects many aspects of society. During drought conditions, many agencies and organizations will be responsible for providing different sectors with accurate information associated with the diverse implications of drought (e.g.,

water conservation messages). This could be done by setting up a phone number. Health departments should anticipate the need to provide diverse groups with appropriate drought-related health information and to respond to various requests for assistance.

Part 4. What Recovery and Resilience could look like.

According to the UN, 2019 was the second warmest year on record and the end of the warmest decade (2010- 2019) ever recorded. Carbon dioxide levels and other greenhouse gases in the atmosphere rose to new records in 2019 (UN, 2019). However, climate change is affecting every country on every continent and every community as well. It is disrupting national economies and affecting lives. Weather patterns are changing, sea levels are rising, and weather events are becoming more extreme. Saving lives and livelihoods requires urgent action to address the climate crisis.

Below are six climate-positive and urgent actions my community will need in place to move toward a place of " recovery" to combat climate change and its impacts to take once they go about building back their communities, economies and societies:

- Green transition: Investments must accelerate the decarbonization of all aspects of our economy.
- Green jobs and sustainable and inclusive growth
- Green economy: making societies and people more resilient through a transition that is fair to all and leaves no one behind.
- Invest in sustainable solutions: fossil fuel subsidies must end, and polluters must pay for their pollution.

- Confront all climate risks
- Cooperation – no country can succeed alone.

To address the climate emergency, post-pandemic recovery plans need to trigger long-term systemic shifts that will change the path or route of CO2 levels in the atmosphere.

New Mexico will need the proper measures to conserve water in both residential and agricultural uses and how water need to be increased to ensure water for what New Mexico need.

With conservation goals and existing water conservation efforts in mind, it is now time to specify the new water conservation measures. Recommended conservation measures, include, but are not limited to, the following:

- Public Education/Information.

  Education and informational materials directed to the water-using public for the purposes of explaining the need for the conservation program and how to conserve water

- In-School Education.

  Specific information-based programs directed to school to promote conservation among school-age children.

- Metering.

  Metering for the purposes of water conservation should include installation of meters at all water source, import or export points, consumer service connections, public landscape irrigation site (one acre or larger) including self-supplied golf courses, greenbelts

- Pressure Reduction.

  A program to reduce water pressure in the distribution system and at service connections to reduce waste.

- Indoor audits and Incentives.

  Indoor plumbing fixture and appliance audits, retrofits, and incentive programs for residential and agricultural sites designed to eliminate leaks/losses and provide an opportunity to install water-saving devices.

- Irrigation with Reclaimed Wastewater.

  Use of reclaimed and treated wastewater for nonportable water uses such as landscape irrigation can be an effective way to conserve water at large facilities such as parks and golf courses.

- Water Waste Ordinances.

  Water waste ordinances typically list specific uses of water that are deemed wasteful. These can include landscape irrigation during the hottest daytime hours like when the evaporation rate is at its highest and excessive water runoff from irrigation or other water uses.

    - One of the first steps that should be taken toward agriculture water conservation in New Mexico is accurate accounting of basin wide water use.

However, New Mexicans have been acquiring new water sources and developing new methods of accessing and increasing water supply: constructing dams and reservoirs, drilling ever deeper wells, pumping groundwater over long distances, desalination of brackish water, and other means. Continuing this search for the remaining unclaimed water sources will be increasingly more expensive, energy intensive, and environmentally challenging. Reducing water use through

conservation on the other hand increases the available water supply. Every gallon saved is a gallon that does not have to be found elsewhere. It is also a relatively inexpensive strategy. Thus, water conservation can go a long way toward ensuring that a community has enough water to meet demands in both residential and agricultural uses. And Health officials in the communities and around the World have spent considerable time and effort in recent years to develop plans to chart a safer and more sustainable future for their citizens in the community. Taking these on board now as part of recovery planning can help the world build back better from the current crisis.

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