Using Satellite Data to Quantify the Impacts of NO_2 and $PM_{2.5}$ on Type 2 Diabetes

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Air pollution, the physiologically detrimental chemicals or substances in Earth's atmosphere, often pose human health risks. Adverse air quality has been associated with insulin resistance and type 2 diabetes (T2DM). Inconsistencies in the air pollution and T2DM relationship could be in part due to the inability to reliably measure exposure. While air quality data obtained from ground-based monitoring systems are convenient, they have their limitations. Many geographical regions do not have these systems implemented due to financial and/or topographical factors leaving approximately 42 million people in unmonitored areas. Additionally, research conducted with the US Environmental Protection Agency (EPA) air quality data tends to provide accurate exposure when near an EPA monitoring station. This may not accurately reflect unmonitored area exposure. Features such as nearby roadways, elevation changes, or an adjacent canyon can impact the exposure levels. Furthermore, most societies spend the majority of their time indoors where the air pollutants are less concentrated, however, those in lower socioeconomic groups tend to live in homes that allow more of the ambient air to seep in. Native Americans living on Tribal lands are an example of a group that often experiences lower socioeconomic status as well as limited air pollution monitoring. According to the CDC, Native Americans have a greater chance of developing diabetes than any other racial group, but many tribal areas lack a ground-based monitoring system. To begin to address these failings, a widespread air quality assessment method would be instrumental in analyzing the impacts of pollutants on T2DM. The National Aeronautics and Space Administration's (NASA) satellite air quality measurements provide increased spatial coverage without geographical limitations. NASA's satellite-mounted air quality sensors provide daily global exposure data of NO_2 and $PM_{2.5}$ concentrations through geographic coordinate-specific values. These measurements are convenient to quantify spatially and temporally varied aerosol distribution patterns which can provide an improved understanding of potential pollutant sources. The primary objective of this research project is to inspect satellite data for NO_2 and $PM_{2.5}$ pollutants to attain a more accurate and thorough representation of atmospheric pollutant exposure and its association with T2DM. Future research will also include data from the MAIA satellite, NASA's first health-based satellite mission. This research project's insight on air quality exposure, and the subsequent impacts on health, will contribute to the utility of satellite-health applications.