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Ascertaining Age Group-specific Association between PM2.5 and Human Seasonal Influenza in 11 Study Sites in Taiwan

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Objective: Recently, the impact of ambient fine particles, and especially that of particulate matter 2.5 ($PM_{2.5}$), on human health has garnered much attention. Many studies have revealed positive associations of PM2.5 with human health outcome, including asthma, pulmonary fibrosis, and cancer. Annual $PM_{2.5}$ concentration in most cities in Taiwan has been higher than the lowest concentration recommended by the World Health Organization (WHO). Long-term exposure to the ambient fine particles potentially causes more severe inflammation and pulmonary epithelium damage in human lung. This study aims to investigate the associations between $PM_{2.5}$ and human seasonal influenza in cities and counties in Taiwan under the hypothesis that higher exposure concentration is associated with severe lung inflammation and epithelial damage, subsequently humans infected by the influenza virus are likely to have more exacerbating response.

Methodology: We choose 3 cities/counties from northern Taiwan and 4 cities/counties each from southern and central Taiwan, including Nantou which is the only land-based administrative region in Taiwan. Moreover, five of the six special municipalities in Taiwan are included in the 11 study sites. The weekly human seasonal influenza data from 2009-2015 are retrieved from National Infectious Disease Statistics System of the Taiwan Centers for Disease Control (CDC). The hourly $PM_{2.5}$ data are retrieved from Taiwan Environmental Protection Administration (EPA). We use Spearman correlation to ascertain the statistical associations between influenza incidence rate and $PM_{2.5}$ in different age groups and in different geographic locations.

Results: The association between $PM_{2.5}$ concentration and influenza incidence rate in all-age groups is statistically significant (p-value<0.05) in southern Taiwan. Moreover, the health risks of adult and the elderly groups seem to increase more significantly in association with regionally higher $PM_{2.5}$ level in Taiwan.

Conclusion: Long-term exposure to higher $PM_{2.5}$ level may lead to more significant increase in human health risk for influenza in Taiwan, especially for the adults and the elderly in Taiwan.

Biography

Ying-Hen Hsieh is an Applied Mathematician and a Professor at the Department of Public Health, China Medical University in Taiwan. His primary research interests focus on mathematical and statistical modeling of infectious diseases as well as analysis of infectious disease epidemiology relating to public health policies.

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