Community-Based Intervention Study on Air Pollution and Respiratory Health in the Elderly

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This study evaluates the effectiveness and scalability of a community-based health and welfare service model to mitigate the health impacts of particulate matter (PM) in adults aged ≥65 years.
Three pilot trials conducted in 2024 demonstrated both feasibility and meaningful impact. In Incheon, a home-visit program that combined PM education, distribution of protective masks, and real-time indoor monitoring reduced indoor PM□.□ from 20.1 to 13.0 μg/m³ ($p = 0.038$) and markedly increased the frequency of checking air-quality reports. In Seoul senior centers, structured environmental education produced significant gains in PM-related knowledge and preventive behaviors, including consistent mask use, improved indoor ventilation, and more frequent operation of air purifiers. A third pilot using repetitive education in smart senior centers achieved a significant downward trend in indoor PM□□ (slope = –0.159 μg/m³/day, $p = 0.002$), demonstrating cumulative benefits of continued engagement and sustained behavior change.

Building on these findings, an enhanced intervention will be implemented in four regions—two administrative districts in Seoul, Chuncheon (Gangwon Province), and Gwangmyeong (Gyeonggi Province)—with a total enrollment of 1,500 participants (750 intervention, 750 control). Local intervention councils will adapt protocols to community contexts and deliver PM education and behavioral programs through local health and welfare services such as home-visit healthcare teams and smart senior community centers. Indoor PM exposure will be monitored in 720 participants for three years using light-scattering devices, complemented by address-based outdoor exposure estimates and detailed time-activity surveys to develop individualized exposure models.

Community workshops and symposia will disseminate integrated results and establish a universal, cost-effective PM intervention protocol. By leveraging existing health services, digital technology, and strong community networks, this multi-site trial aims to reduce PM exposure among vulnerable older adults and provide a scalable, sustainable framework for national environmental health promotion.