

# Air Pollution and Cardiovascular Diseases in Japan: No More An Enigma

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In this issue, Takeuchi *et al.*<sup>1)</sup> reported that the long-term exposure to suspended particulate matter (SPM; a non-gas form of air pollution) would incur higher risk of cardiovascular diseases among Japanese people. We discerned this relation from the American and European studies<sup>2, 3)</sup>; however, the previous Japanese studies<sup>4-6)</sup> failed to show consistent results with those of the West. Moreover, an enigmatic inverse association between SPM and stroke mortality was found in one of the studies. Certainly, when we see that the western countries suffer more from cardiac diseases than cerebrovascular ailments and Japanese people suffer more from cerebrovascular diseases, the inverse association could be due to genetic differences. However, a more plausible source of bias must be considered: The major reason for the puzzling inverse association is, I believe, that the Northern Japan, with extremely low air pollution level and high stroke mortality/morbidity rates, was compared with the polluted area, with higher air pollution and lower stroke mortality/morbidity. Generally, there are many urban-rural gradients, and if you pick two of these, it is often the case that an apparent relation is found, even when there is no causal relation.

In this issue of Journal of Atherosclerosis and Thrombosis, Takeuchi and coworkers brilliantly solved these inconsistencies. First, they selected a cohort in one prefecture, which consisted of seven medical administration areas. Although the northern areas presented lower SPM level compared with the southwestern areas, the SPM level varied substantially within each area. The standardized mortality ratios from circulatory and cerebrovascular diseases varied within each area as well. They even used the mixed-

effects model to control for area-specific differences. Thus, it is unlikely that the results were biased by unidentified area-specific factors.

Second, using only one-prefecture cohort would usually result in smaller study size, and consequently the relation would be inconclusive. It is fortunate that the cohort consisted of over 90,000 subjects even after eliminating ineligible subjects; the cohort size was large enough and the socioeconomic background appeared similar. Because the proportion of the ineligible subjects was 6.5% and that of the lost-to-follow-up was 4.6%, the cohort can be regarded as splendid; only small selection/attrition bias is expected.

As an epidemiologist, I am extremely happy to see Takeuchi *et al.* paper, with valid and robust evidence, resolve the controversy over the long-term SPM impact on cardiovascular diseases.

## Conflicts of Interest

None.

## References

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