

# Exploring life expectancy and its social determinants in China: Enlightenment from a spatial and temporal framework

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Social determinants of health (SDoH) incorporate the multiple social processes that shape living environments and produce a vast difference in public health conditions.<sup>1</sup> Notably, the close associations between SDoH and life expectancy (LE) have been widely measured and identified,<sup>2</sup> indicating that SDoH is one of the most critical factors affecting LE.<sup>3</sup> Although there has been a constancy of LE increments in China over the past decades, marked spatial variations can be seen.<sup>4</sup> Therefore, there are still two obstacles to revealing LE-related SDoH in China. Firstly, the high-quality mortality surveillance data across provinces are superior to census data by providing timely and consecutive evidence. However, mortality surveillance data in China are difficult to obtain, hindering LE distribution and variation investigation. Secondly, although studies have investigated the effects of socioeconomic<sup>5–7</sup> and environmental factors on LE<sup>8,9</sup> in China, it still lacks interpretations of LE and its influence factors within a rationale SDoH framework from a spatial perspective to include the potential effect of adjacent units, while controlling confounders.

In a recent issue of *The Lancet Regional Health – Western Pacific*, Wang and colleagues<sup>10</sup> reported the spatial LE distribution in China, further interpreted both the short-term and long-term direct and indirect effects of SDoH on LE disparities. Using a large data source covering over 300 million people in mainland China spanning fifteen years, this study comprehensively depicted the LE distribution of a long consecutive period with a well-designed representation, interpreting the time-varying change of SDoH and LE disparities at the

provincial level in China. Furthermore, this study developed a proxy diagram framework to demonstrate the relationship between SDoH factors (regarding socioeconomic development and equity, healthcare resources, and population characteristics) and LE. Strikingly, the authors quantified the association between SDoH proxies and LE disparities based on spatial panel data model construction. The SDoH proxies directly affected LE at the local level and exerted spatial spillover effects on geographical adjacent provinces in China. Meanwhile, meteorological factors were collected as potential confounders to ensure reliability.

The study by Wang and colleagues<sup>10</sup> is commendable. According to their findings, several implications and thoughts can be enlightened to bridge the spatial gaps between LE and SDoH in China. Firstly, this study can provide a clue to investigate geographic disparities and measure local and neighborhood health outcomes at the ecological level. In China and other countries with high spatial heterogeneity, exploring SDoH factors influencing LE can play an essential role in optimizing a supportive socioeconomic environment and targeting health interventions to reduce spatial health disparities and increase LE, thereby contributing to local social development. Secondly, policy externalities resulting from the spatial spillover effects of SDoH proxies should be studied among provinces that are geographically close. Thirdly, to avoid the widening gap between developed and less developed provinces, compensation for health care and medical resource distribution should be provided to provinces with lower LE. Finally, in order to eliminate health inequities and promote LE, integrated population strategies should be combined to optimize an enabling socioeconomic environment.

Although the study shows a national picture based on well-designed spatial modeling, Wang and colleagues pointed out several limitations as well, e.g., its lack of causal inference, omitted variables and potential confounders, the uncertainty caused by internal migration across rural-urban areas, under-reporting of death cases. Further studies are therefore needed in the future. For instance, a sophisticated theoretical framework can be constructed to demonstrate the upstream

**The Lancet Regional Health - Western Pacific**  
2022;23: 100469  
Published online xxx  
<https://doi.org/10.1016/j.lanwpc.2022.100469>

DOI of original article: <http://dx.doi.org/10.1016/j.lanwpc.2022.100451>

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influences on LE. It would also be helpful to analyze the non-linear effect to better understand the results with robustness. Furthermore, physical environmental factors, such as air pollution, could be integrated into the research framework to gain a more complete picture of the influence mechanism of LE in China.

## Contributors

Dr. Wang wrote the original draft of the manuscript. Dr. Ren revised the work and suggested critical edits. All authors have approved the final version of the manuscript for publication and agree to be jointly responsible for the work.

## Declaration of interests

The authors declared no competing interests.

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