

Detailing the structure of carbon footprint focusing on long-term care demand in Japan

Topic: Input-output Analysis for Policy Making (4)

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The Research Question

As Planetary Health advocated, the importance of quantifying the carbon footprint (CF) of healthcare supply chains has increased. Despite global studies on the healthcare sector's CF, research on the CF of long-term care services, crucial to human health and welfare, remains insufficient.

Looking at Japan, which has one of the most ageing populations in the world, the number of people certified for long-term care is increasing as the population ages, and is projected to reach 9.77 million by 2045. Such progress in an ageing society and the increase in those people will affect the structure of household consumption. In this sense, Nansai et al. (2020) clarified that the consumption-based greenhouse gas (GHG) emissions (i.e. carbon footprint; CF) derived from long-term care services accounted for 10.1 Mt-CO₂eq in 2011. However, it is unclear how much the people who need long-term care contribute to these emissions yet. Shigetomi et al. (2014) estimated that the Japanese household CF will decrease by 4.2 % from 2005 to 2035 as a lower birth rate with an aging population. However, this estimation assumed that the consumption pattern of each bracket of the age of household head in 2005 would be fixed until 2035, not taking account into the change in consumption patterns.

Against this backdrop, we aim at highlighting both the CF of households with people who are certified for long-term care and the impact of the increase in those people on future CF with a focus on Japan.

The Method and Data

To achieve the objective, an environmental input-output analysis based on the Japan input-output table (JIOT) was conducted. Although it is not possible to trace the international flow as precise as a multi-regional input-output table, JIOT is described by about 400 commodity sectors that enables us to analyze the consumption-based environmental pressures on the medical and long-term care sectors. This study therefore employed the input-output inventory on JIOT and could consider "Long-term care services (except facility services)" and "Long-term care services (facility services)" for the long-term care sectors.

Next, we utilized the domestic household consumption data (National Survey of Family Income and Expenditure; NSFIE) and long-term care insurance data (Survey of Long-term Care Benefit Expenditures) to understand the detailed CF structures across household attributes focusing on those who are identified as needing long-term care. In addition, the CF on long-term care ("Facility services," "In-home services," and seven other categories in total) for the seven certification levels of long-term care were identified.

Finally, we considered a Universal Health Insurance System in Japan, which allows Japanese people to receive medical services with a 10%–30% co-payment depending on their age and income. For this reason, NSFIE includes only the co-payment of medical-consumption expenditures. Therefore, based on household-consumption data, we extended household consumption expenditures for medical commodities to include publicly funded healthcare expenditures in each household's consumption.

The Novelty of the Research

As a result, the CF on long-term care services varied from 117 to 4392 kg-CO₂eq per person per year, depending on the level of long-term care required. Besides, it was found that households with people who are certified for long-term care generated 1.4 times larger CF than households without

those people. Regarding the pattern of CF, the largest difference between households with and without people who are certified for long-term care was engendered in the long-term care sector. Additionally, households with people who are certified for long-term care were more likely to generate the CF on goods associated with staying home, such as electricity and gases. The previous studies reported that elderly households would generate lower CF per capita than young and middle-aged households. However, we figured out that the CF would considerably increase regarding both a person who is certified for long-term care in a household and the compensation of long-term care insurance. We also estimated that the CF on long-term care services would reach 22 Mt-CO₂eq in 2050 (2% of Japan's total CF in 2020).

Conclusively, the novelty of this study is to highlight that an increase in people who need more serious long-term care may boost GHG emissions unexpectedly. Our study suggests, in other words, suppressing the number of people who are certified for long-term care is useful for both health and climate-change mitigation. Undoubtedly, the demands of long-term care should not be limited in a top-down manner. Therefore, the government in nations with its ageing population such as Japan, should promote long-term care prevention to reduce the number of people certified for long-term care and develop a GHG mitigation strategy focused on the long-term care sector. For future s