

Municipality-Level Estimates of Total Fertility Rate using Indirect Standardization

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Bayesian estimates have been widely used to describe the differences in fertility rates of Japanese municipalities (MHLW 2020). While the Bayesian approach is sophisticated and reliable, it requires age-specific birth rates for the calculations, which show instability in small populations, and therefore, it forces them to accumulate five-year births data, delaying the release of the official estimates. Furthermore, Bayesian estimates tend to underestimate the regional variation of fertility rates (Koike 2021). To address these issues inherent in the Bayesian approach, we propose an alternative method based on indirect standardization, which allows us to estimate municipal total fertility rates only with total births and female population by age.

Our model requires three simple inputs: (1) age-specific fertility rates (ASFR) used as a standard schedule, (2) the numbers of women by age corresponding to ASFR in a municipality, and (3) the number of total births in the same municipality. Our results show that indirect standardization produced similar estimates for large-population municipalities (e.g., ones with a total population of 10,000 or more; 98.5% of births among all Japan). On the other hand, comparison of the indirect standardized estimates with the Bayesian counterparts revealed that the latter underestimated regional differences in fertility rates for small-population municipalities (e.g., ones with a total population of less than 10,000; 1.5% of births among all Japan). Conversely, our model might have yielded an unreasonably large variance, which suggests that further studies improve the proposed method.

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