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# Mathematical Approach to Estimate Mineral Requirements from Population Data

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**Abstract:**

Determination of mineral requirements is crucial in developing dietary guidelines. The established methods for estimating mineral requirements are balance method, factorial method and saturation method. As an alternative, a mathematical approach for estimating mineral requirements from the population data of mineral status (distribution of dietary intake and the prevalence of inadequate status) has been proposed. The prevalence (D) of inadequate nutritional status is the proportion of individuals with inadequate nutritional status: D=(Sum of individuals whose dietary intake < requirement)/(total number of individuals). Assuming that requirements and dietary intakes follow a certain distribution function, an estimated mean requirement is obtained as a solution of the integral equation describing the above relationship. The appropriate distribution function for iron requirement and iron intake was elaborated for the specific age-sex group. The population data of iron status obtained from the National Health and Nutrition Survey in Japan, 2003 were analyzed, assuming a coefficient of variation of 10% for iron requirements. The estimated median iron requirement was 3.7, 4.1, 5.4 and 6.0 mg/d for Japanese males aged 18-29, 30-49, 50-69, and $\geq$ 70 years old, respectively; and was 8.4, 9.3, 6.3 and 6.0 mg/d for Japanese females aged 18-29, 30-49, 50-69, and $\geq$ 70 years old, respectively. The estimated mean iron requirements were same as the corresponding medians except for females aged 18-29 and 30-49 years old. The estimated mean iron requirement was 9.2 and 10.1 mg/d for females aged 18-29 and 30-49 years old, respectively. In the framework of Dietary Reference Intakes both in Japan and the US, the estimated average requirement (EAR) is defined as the median of the estimated requirement. We propose that the mathematical approach using populational nutriture data can be useful to estimate mineral requirements and to make up dietary guidelines for minerals.

**Key words:** iron requirement, estimated average requirement, population data of nutritional status, mathematical approach, integral equation

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