Linking vitamin D status to vitamin D intakes: Fitting a nonlinear model with measurement error

Abstract
Sufficient vitamin D levels are essential to maintain healthy bones and to reduce risk of fracture. It is difficult, however, to determine recommended intake levels, due to the complexity of the metabolism of the vitamin D we consume. Vitamin D levels (or status) depend on factors other than consumption of vitamin D from food and supplements; for example, they depend on sun exposure, skin pigmentation, adiposity and several others. A biomarker for vitamin D status is a person’s 25-hydroxy vitamin D (OHD) level. From a practical viewpoint, we cannot make public health recommendations using OHD levels. Ideally we want be able to make recommendations for intakes of vitamin D. In our work, we model the association between intake of vitamin D from all sources and the level of OHD in the serum. Since we can only obtain noisy measurements of vitamin D intake, we fit a nonlinear model where vitamin D intake (as well as other covariates) are contaminated with measurement error. Initial results suggest that there is indeed a nonlinear association between OHD and vitamin D intake — with differences between ethnicities.