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A Correction Note on Small Area Estimation

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The article "Small Area Estimation—New Developments and Directions" by Danny Pfeffermann published in the *International Statistical Review* (2002), **70** (1), 125–143 has an error. Equation (6.4) on p. 139 should be:

For known coefficients a_0 and a_1, and known variances σ_u^2 and σ_ϵ^2, the best linear unbiased predictors of the area means for areas in the sample and for areas not in the sample are correspondingly,

$$\hat{\theta}_{s,i} = \gamma_i \bar{y}_i + (1-\gamma_i)\hat{\mu}^\star - a_1\sigma_u^2, \tag{1}$$

and

$$\hat{\theta}_{c,i} = \hat{E}(\theta_i \mid i \notin s, y) = \hat{\mu} - a_1\sigma_u^2 \frac{k\exp\left(a_0 + a_1\hat{\mu} + 0.5a_1^2\sigma_u^2\right)}{1 - k\exp\left(a_0 + a_1\hat{\mu} + 0.5a_1^2\sigma_u^2\right)}, \tag{2}$$

where $\bar{y}_i = n_i^{-1}\sum_{j=1}^{n_i} y_{ij}$, $\hat{\mu}^\star = (\sum_{i=1}^m \nu_i)^{-1}(\sum_{i=1}^m \nu_i\bar{y}_i)$, $\nu_i = n_i/(n_i\sigma_u^2 + \sigma_\epsilon^2)$, $\gamma_i = \sigma_u^2\nu_i$, $\hat{\mu} = \hat{\mu}^\star - a_1\sigma_u^2$ and $y = \{y_{ij}; i = 1,\ldots,m; j = 1,\ldots,n_i\}$ defines the observed y-values.

Proof. (I) Prediction of the area means for areas in the sample

Population model: the unit level random effect model,

$$\begin{aligned} y_{ij} &= \theta_i + \epsilon_{ij},\ \epsilon_{ij} \sim NI\left(0, \sigma_\epsilon^2\right), \quad j = 1,\ldots,N_i \\ \theta_i &= \mu + u_i,\ u_i \sim NI\left(0, \sigma_u^2\right), \quad i = 1,\ldots,M, \end{aligned} \tag{3}$$

where ϵ_{ij} and u_i are independent.

Sampling design: two-stage sampling design. Let s denote the sample of areas and s_i the sample of units from sampled area i.

(a) The selection of areas is with probabilities $\pi_i = \Pr(i \in s)$ such that

$$E_p(\pi_i \mid \theta_i) = k\exp(a_0 + a_1\theta_i);\ k > 0. \tag{4}$$

(b) The sampling process within the areas is noninformative.