

ON  $\beta$ -CONTENT TOLERANCE LIMITS  
FOR THE BALANCED RANDOM ONE-WAY MODEL

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ABSTRACT

*This article discusses a procedure for constructing tolerance limits for two-stage sampling from normal populations. The two-sided  $\beta$ -content tolerance limits suggested by Limam (1990) are modified, and then compared with those developed by Mee (1984). A simulation study is conducted to estimate the confidence level of the modified limits. This study shows that when the ratio of the between and within variances is small the modified limits are conservative but narrower than those of Mee. When the ratio is large we need to take a small number of subunits for the modified limits to be competitive. As a correction for this instability an approach for sample size determination is suggested to provide adequate confidence levels for the suggested tolerance limits.*

KEY WORDS

Cluster sample, Satterthwaite approximation, Variance Component, Statistical inference.

1. INTRODUCTION

When a population consists of many batches, an appropriate model for the measurements  $Y$  is the random one-way model, also called cluster sampling model,

$$Y_{ij} = \mu + b_i + e_{ij}, i = 1, \dots, I, j = 1, \dots, J, \quad (1.1)$$

where  $\mu$  is the population mean,  $\mu + b_i$  the mean of the  $i^{\text{th}}$  batch, and  $e_{ij}$  a random deviation. We assume that  $b_i$  and  $e_{ij}$  are distributed independently as normal

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