A class of inference problems arising in wireless sensor network contexts is addressed, where nodes aim at estimating cooperatively a parameter based on opportunistically gathered measurements. To allow for generality, non-homogeneities are taken into account in the formulation; furthermore, knowledge of the data distribution is not assumed. A novel linear estimation approach is devised based on a hierarchical modeling, able to cope with local conditions (e.g., due to manufacturing differences, diverse classes of nodes, and/or spatial variability) and heterogeneity of the samples (which cannot be controlled in opportunistic inference). The total variance of the hierarchy is derived, then used to optimize the weights of the linear estimator, obtaining in closed-form the minimum-variance solution of the general non-homogeneous inference problem. The proposed approach induces in the optimal weights a scalar parameter as additive term to the local sample sizes; this acts like a Tikhonov regularization on the variance contributions brought by the cooperating nodes, which reflect local conditions and are inversely proportional to the sample size. As a result of this regularization effect, robustness against heavy-tailed variations of the number of measurements available at the different nodes is achieved. A thorough theoretical analysis, corroborated by numerical results, reveals that the proposed distribution-free approach is superior to both linear and weighted least-squares, and can perform closely to the “oracle” minimum-variance estimator.