Article title: Spatial Distribution and Birth Prevalence of Congenital Heart Disease in Iran: A Systematic Review and Hierarchical Bayesian Meta-analysis

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Supplementary file 3. Bayesian Hierarchical Pooling of CHD Birth Prevalence

The posterior density is denoted by p (μ,τ|y,σ). This is the conditional distribution of μ and τ and given the values of y and σ[1] .

Let Y_i denote the number of people with CHD in the i-th paper, N_i the corresponding total sample size, and p_i the underlying prevalence. First, Y_i follows a $Binomial$ distribution, so we have $Y_i|p_i \sim Binomial(N_i, p_i)$. Next, we assume p_i is a random variable with a probability density function. Therefore, the logit transformation of p_i has a Normal distribution. We assume

$$logit(\,p_i) = \log\left(\frac{p_i}{1-p_i}\right) = u_i \; and \; u_i \sim Normal(\mu, \tau^2)$$

For the mean μ of the normal distribution of logarithm of odds a weakly informative normal prior distribution (with mean= 0 and variance = 100), and for the variance τ^2 a slightly more informative half-normal prior distribution (with variance=0.5) [1-3]

Finally, We converted these estimates (logit[1]) back to the prevalence with the following formula:

P= [exp(log odds)/(exp(log odds) + 1)]

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[1] log odds