**Supplementary file 3**

**Notations of statistical models used in this study (results of these models are in Supplementary file 1)**

|  |  |
| --- | --- |
| Fromula | Variance components (normally distributed with the mean of 0 and given $σ\_{}^{2}$ values |
| $$Zr\_{i}=β\_{0}+County\_{k\left[i\right]}+State-code\_{j\left[i\right]}+Effect-size\_{i}$$ | $$County\_{k}∼N\left(0,σ\_{country}^{2}\right)$$$$State-code\_{j}∼N\left(0,σ\_{State-code}^{2}\right)$$$$Effect-size\_{i}∼N\left(0,σ\_{Effect-size}^{2}\right)$$$$Sampling-error\_{i}∼N\left(0,σ\_{Sampling-error\_{i}}^{2}\right)$$ |
| $$Zr\_{i}= β\_{0}+β\_{1}\*z(ln(checklist duration))\_{i}+County\_{k\left[i\right]}+State-code\_{j\left[i\right]}+Effect-size\_{i}$$ | $$County\_{k}∼N\left(0,σ\_{country}^{2}\right)$$$$State-code\_{j}∼N\left(0,σ\_{State-code}^{2}\right)$$$$Effect-size\_{i}∼N\left(0,σ\_{Effect-size}^{2}\right)$$$$Sampling-error\_{i}∼N\left(0,σ\_{Sampling-error\_{i}}^{2}\right)$$ |
| $$Zr\_{i}=β\_{0}+β\_{1}\*Sampling-variance\_{i}+County\_{k\left[i\right]}+State-code\_{j\left[i\right]}+Effect-size\_{i}$$ | $$County\_{k}∼N\left(0,σ\_{country}^{2}\right)$$$$State-code\_{j}∼N\left(0,σ\_{State-code}^{2}\right)$$$$Effect-size\_{i}∼N\left(0,σ\_{Effect-size}^{2}\right)$$$$Sampling-error\_{i}∼N\left(0,σ\_{Sampling-error\_{i}}^{2}\right)$$ |
| $$Zr\_{i}=β\_{0}+β\_{1}\*z(ln(checklist duration))\_{i}+β\_{2}\*Sampling-variance\_{i}+County\_{k\left[i\right]}+State-code\_{j\left[i\right]}+Effect-size\_{i}$$ | $$County\_{k}∼N\left(0,σ\_{country}^{2}\right)$$$$State-code\_{j}∼N\left(0,σ\_{State-code}^{2}\right)$$$$Effect-size\_{i}∼N\left(0,σ\_{Effect-size}^{2}\right)$$$$Sampling-error\_{i}∼N\left(0,σ\_{Sampling-error\_{i}}^{2}\right)$$ |
| $$Abundance\_{i}=β\_{0}+β\_{1}\*log10(range size)+Error\_{i}$$ | $$Error\_{i}∼N\left(0,σ\_{error}^{2}A\right)$$ |
|  |  |

$Zr\_{i}$ denotes the *i*th effect size, $β\_{0}$ is the intercept, $β\_{1}$ and $β\_{2}$ are regression coeffects, $County\_{k}$ is the kth country, $State-code\_{j}$ is the *j*th state code and $Effect-size\_{i}$ is the *i*th effect size, and z(ln(checklist duration)), Sampling-variance and log10(range size) are fixed effects (predictors; see Method).