This describes how to disaggregate national FIES rates by urban and rural areas

For a given country, we have the following variables:

- ω: The percentage of households in urban areas in a country with food insecurity (UNKNOWN)
- ρ: The percentage of households in rural areas in a country with food insecurity (UNKNOWN)
- t: The overall percentage of households in a country with food insecurity (KNOWN)
- RUR: The total population in rural areas (KNOWN)
- URB: The total population in urban areas (KNOWN)
- TOT: The total population (KNOWN)
- $ratio$: The ratio of the rates of urban food insecurity to rural food insecurity. This is known at a regional level, and it is estimated that the same ratio holds at the individual country level.

Lets start from the following two assumptions/equations:

$$\omega/\rho = ratio \tag{1}$$

$$\omega * URB + \rho * RUR = t * TOT \tag{2}$$

Now we can derive the value of ω from Equation 1.

$$\omega = \rho * ratio$$

Substituting that value into Equation 2 yields:

$$\rho * ratio * URB + \rho * RUR = t * TOT$$

Solving for ρ:

$$\begin{aligned} \rho * ratio * URB + \rho * RUR &= t * TOT \\ \rho * (ratio * URB + RUR) &= t * TOT \\ \rho &= \frac{t * TOT}{ratio * URB + RUR} \end{aligned}$$

Then, given ρ, we can solve for ω with Equation 2.