

## Weighted score calculations

The following are details regarding how the above scores are calculated, using some of the values in the annotated table above to illustrate. Each weighted score is calculated as a percent difference of the value for a given site compared to the target value selected by the user. Here, GP stands for the Grad/Professional degree variable, HV stands for the **Median Home Value** variable and MA stands for the **Median Age** variable.

As the [above table](#) illustrates, Candidate 3 site has the highest suitability score of 0.86 (Cell 1A). This score is calculated by adding the weighted scores for each of the three variables (GP, HV, MA) used in the analysis.

1. First, we will examine how the number of households with graduate degrees (GP) contributed to this score.
  - o Site Candidate 3 has 1013 households with Grad/Professional Degree (Cell 1B).
  - o The maximum value for GP across all the sites is 1272 households for the site Candidate 2 (Cell 2B).
  - o Similarly, the smallest value for GP across all the sites is 821 households for site Candidate 1 (Cell 3B).

In this example, the greater number of people with graduate degrees is desired. This is a positive relationship, so these values are plugged into this formula to calculate the score for GP for Candidate 3:

$$\left( \frac{GP(\text{Candidate 3}) - \text{minValue}}{\text{maxValue} - \text{minValue}} \right)$$

We can calculate what the score is for GP for Candidate 3 using the values outlined above:

$$\left( \frac{1013 - 821}{1272 - 821} \right) = 0.43$$

This means, that Candidate 3 has a score of 0.43 (Cell 1C). Once the score is calculated, the weight is then applied to the value to determine how much GP will contribute to the total suitability score for the site. In our example, a weight of 20% was applied to GP. Therefore, the weighted score for GP is calculated as 0.09 (Cell 1D):

$$0.20 * 0.43 = 0.09$$

The whole weighted score calculation for Candidate 3 can be expressed as:

$$\text{WeightedScore}_{GP}(\text{Candidate 3}) = 0.20 * \text{abs} \left( \frac{GP(\text{Candidate 3}) - \text{minValue}}{\text{maxValue} - \text{minValue}} \right)$$

Note:

$\text{abs}$  is the absolute value function.

2. Next, let us see how the Median Home Value of the site (HV) contributed to the score:
  - The homes within the area of site Candidate 3 have a Median Home Value of \$281,545 (Cell 1E).
  - The maximum value for HV across all the sites is \$569,638 for the site Candidate 5 (Cell 5E).
  - Similarly, the smallest value for HV across all the sites is \$281,545 for site Candidate 3 (Cell 1E).

Here, a lower Median Home Value is desired, as an indicator of better affordability. This is an inverse or negative relationship, so these values are plugged into this formula to calculate the score for GP for Candidate 3:

$$\left( \frac{\text{maxValue} - HV(\text{Candidate 3})}{\text{maxValue} - \text{minValue}} \right)$$

We can calculate what the score is for HV for Candidate 3 using the values outlined above:

$$\left( \frac{569638 - 281545}{569638 - 281545} \right) = 1$$

This means, that Candidate 3 has a score of 1 (Cell 1F). Once the score is calculated, the weight is then applied to the value to determine how much HV will contribute to the total suitability score for the site. In our example, a weight of 60% was applied to HV. Therefore, the weighted score for GP is calculated as 0.60 (Cell 1G):

$$0.60 * 1 = 0.60$$

The whole weighted score calculation for Candidate 3 can be expressed as:

$$\text{WeightedScore}_{HV}(\text{Candidate 3}) = 0.60 * \text{abs} \left( \frac{HV(\text{Candidate 3}) - \text{maxValue}}{\text{maxValue} - \text{minValue}} \right)$$

3. Lastly, let us examine how the Median Age of the people living in the area (MA) contributed to the score:
  - The population living in the area of site Candidate 3 has a Median Age of 29.9 (Cell 1H).
  - The maximum value for MA across all the sites is 51.5 for the site Candidate 5 (Cell 5H).
  - The minimum value for MA across all sites is 29.9 for the site Candidate 3 (Cell 1H).

Here, an ideal value of 32 was selected, as a median age closer to 32 is more desirable. These values are plugged into this formula to calculate the score for MA for Candidate 3:

$$1 - \left( \frac{Ideal\ Value - MA(Candidate\ 3)}{\max((ideal - min), (max - ideal))} \right) = 1 - \left( \frac{32 - 29.9}{\max((32 - 29.9), (51.5 - 32))} \right) = 1 - 0.11 = 0.89$$

This means, that Candidate 3 has a score of 0.89 (Cell 1I). Once the score is calculated, the weight is then applied to the value to determine how much MA will contribute to the total suitability score for the site. In our example, a weight of 20% was applied to MA. Therefore, the weighted score for MA is calculated as 0.18 (Cell 1G):

$$0.20 * 0.89 = 0.18$$

$$WeightedScore_{MA}(Candidate\ 3) = 0.20 * \left( 1 - \frac{MA(Candidate\ 3) - Ideal\ Value}{\max(abs(ideal - min), abs(ideal - max))} \right)$$

Note:

In this example we have not adjusted the threshold for any of the variables. If, for example, the threshold had been set such that the GP value for Candidate 3 did not fall within the specified range, then the weight for that variable would default to 0 and effectively GP wouldn't be used in the final score calculation - filtering would be applied and that particular suitability score would not be used in the final results table.

Final score is calculated as:

$$\begin{aligned} FinalScore(Candidate\ 3) &= WeightedScore_{GP}(Candidate\ 3) + WeightedScore_{MA}(Candidate\ 3) \\ &\quad + WeightedScore_{HV}(Candidate\ 3) \\ &= 0.09 + 0.18 + 0.6 \\ &= 0.87 \end{aligned}$$

The final score you see in the table is slightly lower, at 0.86, but that's only because it adds the unrounded values instead of the rounded values we used here:

Results Table												
Rank	Sites	0.75 miles -	Final Score	2016 Education: Grad/Professional Degree			2016 Median Home Value			2016 Median Age		
				value	score	weighted score	value	score	weighted score	value	score	weighted score
1	Candidate 3	0.75 miles -	0.86	1,013	0.43	0.09	\$281,545	1.00	0.60	29.9	0.89	0.18
2	Candidate 2	0.75 miles -	0.80	1,272	1.00	0.20	\$307,230	0.70	0.42	34.1	0.89	0.18
3	Candidate 1	0.75 miles -	0.63	821	0.00	0.00	\$323,324	0.85	0.51	40.1	0.58	0.12
4	Candidate 4	0.75 miles -	0.60	1,004	0.41	0.08	\$376,516	0.67	0.40	39.8	0.60	0.12
5	Candidate 5	0.75 miles -	0.08	996	0.39	0.08	\$569,638	0.00	0.00	51.5	0.00	0.00

This walkthrough gave you a basic understanding of how suitability analysis works. You were able to create a ranked list of the top 3 most suitable senior centers in the area, for your client's weighted criteria from the point of view of house hunting.

You may add additional sites and variables, and further adjust the settings to perform an even more sophisticated suitability analysis. You could further enhance your analysis by including relevant variables that are attributes of the sites being scored. For example, every senior center may have a rating, which is an indicator of quality. You may want to factor that into your suitability analysis, with the **Add attributes from sites** option under Add Criteria.

