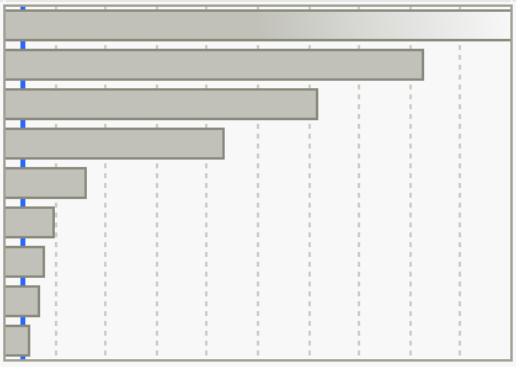
Logworth Analysis

This document performs a Logworth p-value analysis (logarithmic transformation of the p-value for better comparison) on the independent variables in our model compared to the dependent variable, in this case the liveability score. For the first (sub)analysis, the weighted average age and standard deviation is included, while in the second (sub)analysis we include age in bins.

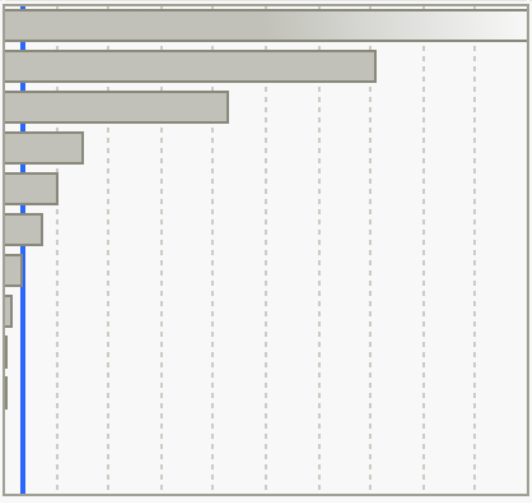
Source	Logworth	PValue
Income	51,615	0,00000
prop_university	41,275	0,00000
Weighted_Average_Age	30,736	0,00000
pop_density	21,697	0,00000
single_family_housing	7,970	0,00000
worker	4,976	0,00001
prop_women	3,776	0,00017
Standard_Deviation_Age	3,421	0,00038
Aid	2,371	0,00425



From the figure above, we can see that all variables are (highly) significant to the liveability score.

Now we do the same analysis, however this time we distribute the age variable in proportion bins.

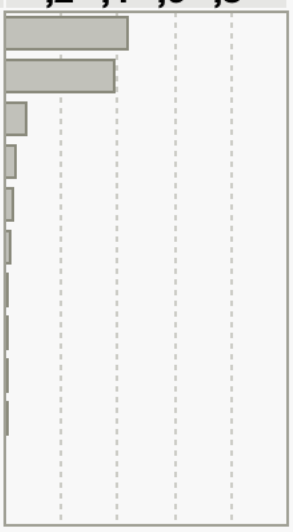
Source	Logworth	PValue
Income	58,048	0,00000
prop_university	35,341	0,00000
pop_density	21,275	0,00000
single_family_housing	7,564	0,00000
worker	5,011	0,00001
prop_women	3,555	0,00028
Aid	1,695	0,02017
prop_0-14	0,701	0,19900
prop_45-64	0,188	0,64868
prop_65+	0,152	0,70425
prop_25-44	0,035	0,92158
prop_15-24	0,019	0,95658



We can conclude that in terms of significance, the same independent variables are significant as in figure 1. However, we see that no single age bin has a significant effect on the liveability score.

Logworth p-values do not incorporate potential interaction terms, so we do not know yet whether these age bins variables do not contribute at all to the model or contribute a lot in terms of interaction. To investigate this, we run a Sobol Sensitivity Analysis on the model with the age bins to see their interaction terms (Total Effect – Main Effect).

Column	Main Effect	Total Effect
Income	0,407	0,43
prop_university	0,361	0,385
prop_0-14	0,052	0,073
pop_density	0,022	0,041
worker	0,012	0,025
prop_women	0,007	0,015
prop_45-64	0,005	0,013
prop_65+	0,006	0,011
Aid	0,004	0,007
single_family_housing	0,003	0,007
prop_25-44	0,001	0,002
prop_15-24	0,001	0,002



In this way, we can conclude that the interaction effect of some age bins (0-14; 45-64; 65+), is higher than the main effect. In other words, these age bins are to some extent useful for the model to explain liveability.