Simpson's Diversity Index

Simpson's Diversity Index is a score that is calculated to show the degree to which an area is diverse in a certain geographical element when compared to another. It looks at the number of one kind of individuals against the total number of individuals within the sample area and gives an index value on a scale between 0 and 1.

0 (Absolute uniformity) 1 (Absolute diversity)

Simpson's Diversity Index is most commonly seen in biodiversity studies but there is no reason why the calculation cannot enhance the study of other geographical topic areas:

- Demography - studying the **ethnic diversity** of a sample population against the national census data.
- Ecology - researching the **variety of tree species** found in two contrasting areas of woodland.
- Development - comparing the **value of aid** coming from different countries to two different recipient countries.
- Coasts - examining the diversity of **rock types** found in the beach sediment along two stretches of coastline.
- Environmental - researching the variety of **different types of litter** found in different areas of the school grounds.
- Weather - studying the variety of **cloud types** witnessed in two separate months, representing different seasons.
- Settlement - researching the diversity of **building ages or architectural styles** along two different transects.
- Industry - comparing the diversity of **goods and services outlets** within two different town centres.

How to carry out a Simpson's Diversity Index calculation

For this example, we will look at the variety of different orientations of moraine in a glacial landscape. The geographical researcher wished to find out if one sample area (that associated with terminal moraine) showed more uniformity in moraine orientation than another sample area (that associated with lateral moraine).

The researcher had a theory that the moraine found at the end of a glacier (terminal moraine) was relatively unsorted and laid down in a way unrelated to the final flow pattern of the glacier. They believed that moraine found along the glacier sides (lateral moraine) would generally be orientated in similar directions, as the movement of the glacier itself would affect its positioning. This created the following hypothesis in the mind of the researcher:

"There will be a greater degree of uniformity of moraine orientation in the lateral areas and a greater degree of diversity of moraine orientation in the terminal areas."

The researcher noted the frequency of different moraine orientations in the field.

Terminal Moraine	
Orientation	Frequency
N - S	3
NNE - SSW	4
NE - SW	1
ENE - WSW	1
E - W	5
ESE - WNW	2
SE - NW	2
SSE - NNW	6

Lateral Moraine	
Orientation	Frequency
N - S	7
NNE - SSW	9
NE - SW	5
ENE - WSW	0
E - W	0
ESE - WNW	1
SE - NW	3
SSE - NNW	0

These individual frequencies of moraine (n) were then divided by the total amount of moraine recorded at each site (N). The result of this calculation was then squared, and the total of these squares noted.

Terminal Moraine			
Orientation	Frequency (n)	n/N	$(n/N)^2$
N - S	3	0.13	0.02
NNE - SSW	4	0.17	0.03
NE - SW	1	0.04	0.00
ENE - WSW	1	0.04	0.00
E - W	5	0.21	0.04
ESE - WNW	2	0.08	0.01
SE - NW	2	0.08	0.01
SSE - NNW	6	0.25	0.06
Total (N)	24	$\Sigma (n/N)^2$	0.17

Lateral Moraine			
Orientation	Frequency (n)	n/N	$(n/N)^2$
N - S	7	0.28	0.08
NNE - SSW	9	0.36	0.13
NE - SW	5	0.20	0.04
ENE - WSW	0	0.00	0.00
E - W	0	0.00	0.00
ESE - WNW	1	0.04	0.00
SE - NW	3	0.12	0.01
SSE - NNW	0	0.00	0.00
Total (N)	25	$\Sigma (n/N)^2$	0.26

The Simpson's Diversity Index value (D) was then calculated using the following equation:

$$D = 1 - (\Sigma (n/N)^2)$$

Terminal moraine: D = 0.83

Lateral moraine: D = 0.74

These results indicate that the orientation of the terminal moraine at this site shows a greater degree of diversity than that of the lateral moraine. Therefore, the researcher can accept their hypothesis.