

What is Simpson's Diversity Index and what are some examples of its application?

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Simpson's Diversity Index is a measure of biodiversity that quantifies the variety of species present in a given area or community. It takes into account both the number of species present and their relative abundance, providing a more comprehensive picture of biodiversity than simply counting species. This index ranges from 0 (no diversity) to 1 (infinite diversity) and is often used in ecological studies to compare the diversity of different habitats or to track changes in diversity over time.

Some examples of Simpson's Diversity Index being applied include assessing the diversity of plant or animal species in a particular ecosystem, comparing the diversity of species in different regions or habitats, and monitoring changes in diversity following environmental disturbances such as deforestation or pollution. It is also commonly used in conservation efforts to identify areas with high levels of biodiversity that should be prioritized for protection. Overall, Simpson's Diversity Index is a valuable tool for understanding and managing the complex relationships between species and their environments.

Simpson's Diversity Index: Definition & Examples

Simpson's Diversity Index is a way to measure the diversity of species in a community.

Denoted as D , this index is calculated as:

$$D = \frac{\sum n_i(n_i - 1)}{N(N - 1)}$$

where:

n_i : The number of organisms that belong to species i

N : The total number of organisms

The value for Simpson's Diversity Index ranges between 0 and 1. The higher the value, the lower the diversity.

Since this interpretation is a bit counterintuitive, we often calculate Simpson's Index of Diversity (sometimes called a Dominance Index), which is calculated as $1 - D$. The higher the value for this index, the higher the diversity of species.

We can also calculate Simpson's Reciprocal Index, which is calculated as $1/D$. The lowest value for this index is 1 and the highest value is equal to the number of species.

For example, if there are 7 different species then the max value for this index would be 7. The higher the value for this index, the greater the diversity of the species.

The following step-by-step example shows how to calculate these various indices for a given community.

Step 1: Collect the Data

Suppose a biologist wants to measure the diversity of species in a local forest. She collects the following data:

Species	Frequency
A	40
B	20
C	15
D	8
E	22

Step 2: Calculate N

Next, she can calculate the total number of organisms.

Species	Frequency
A	40
B	20
C	15
D	8
E	22
	105

N

There are 105 total organisms.

Step 3: Calculate $n_i(n_i-1)$

Next, she can calculate $n_i(n_i-1)$. For example, the first species would be calculated as $40*(40-1) = 1,560$. She can repeat this calculation for each species:

Species	Frequency	$n_i(n_i-1)$
A	40	1560
B	20	380
C	15	210
D	8	56
E	22	462
	105	2668
	N	$\Sigma n_i(n_i-1)$

Step 4: Calculate Simpson's Diversity Index

Lastly, we can use the following formula to calculate Simpson's Index:

$$D = \Sigma n_i(n_i-1) / N(N-1)$$

Using the values we found earlier, Simpson's Index can be calculated as:

$$D = 2,668 / (105*(105-1)) = 0.244.$$

We can also calculate Simpson's Index of Diversity as 1 - $D = 1 - 0.244 = 0.756$.

We can also calculate Simpson's Reciprocal Index as $1 / D = 1 / .244 = 4.09$.

Feel free to use this to automatically calculate Simpson's Diversity Index for any dataset.

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