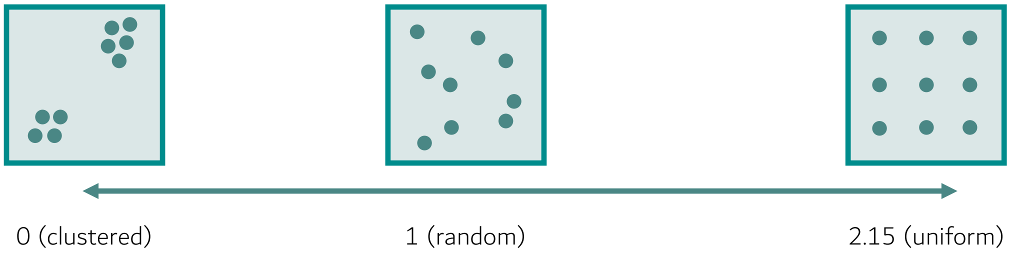
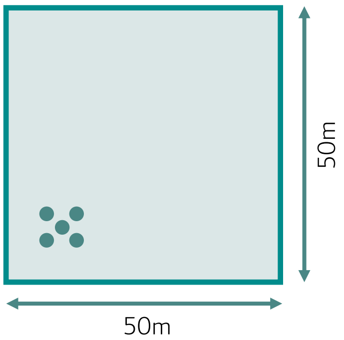
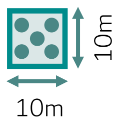
The Nearest Neighbour Index is a score allocated to a sample to indicate a measure of spatial dispersal. It allocates a value between 0 and 2.15 dependent on how clustered or uniform the distribution is in a given study area.



The size of the study area has a large impact on the Nearest Neighbour Index value. For example, a group of points may only appear to be spatially clustered if they are in a large study area, but the same points are thought to be more uniformly distributed if the study area is reduced.



In a large study area, individuals can appear to have a clustered distribution.



In a smaller study area, the same individuals can appear to have a uniform distribution.

Therefore, students need to think carefully about the size of their study area before they start and be able to justify why they have chosen that size area in terms of the geography being researched.

The Nearest Neighbour Index can be used by researchers to measure a variety of different geographical distributions. Research can use the Nearest Neighbour Index to compare the dispersal of the same variable in two contrasting areas, or to compare the dispersal of two different variables in the same study area.

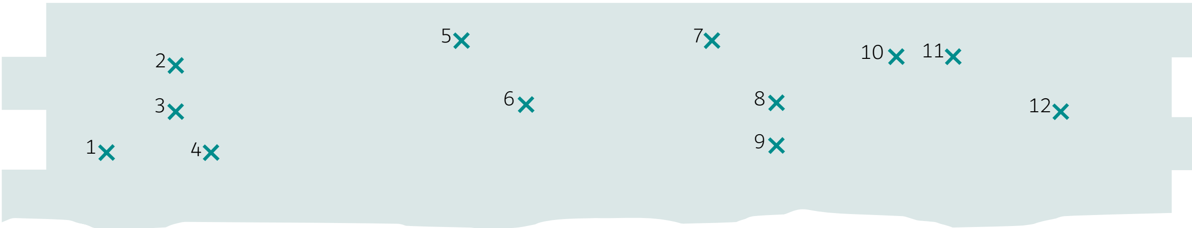
- Ecology - the dispersal of a particular **tree species** in an area of mixed woodland.
- Demography - the spatial variation in different **migrant groups** across a city.
- Industry - the distribution of certain types of **retail outlets** in a given town.
- Development - the spatial variation of **households** in a city where no person is in employment.
- Glaciation - the dispersal of **corries** of different orientations in an upland area.
- Weather - the spatial distribution of **landfall sites for tropical storms** in two different time periods.
- Tectonics - the spatial variations in **earthquakes** along two different fault lines.
- Settlement - the dispersal of different types of **residential dwellings** in an area.

How to carry out a Nearest Neighbour Index calculation:

For this example, a geographical researcher wished to analyse the distribution of cracks along two stretches of sea wall. They wanted to see if the areas of structural weakness in the seawalls were more clustered in the western section (which ran perpendicular to the prevailing wind) than in the eastern section. The researcher therefore formulated the following hypothesis:

> "Areas of structural weakness will be more clustered in the western section of the sea wall when compared to those in the eastern section."

The researcher started by surveying two 20m stretches of the sea wall, one at the western end, facing the prevailing wind directly and the other at the eastern end, running at a parallel angle to the prevailing wind. These two sections were mapped such that the end point of all visible cracks was marked and each observed weakness was allocated a number:



Map of Western sea wall

Map of Eastern sea wall

The researcher then calculated the size of the study area. It is easier to do this at map scale rather than at real world scale (assuming the maps of the sea walls have been plotted accurately and to scale) as it makes successive calculations easier to manage. (In this case, the sea walls' length and height have been 'squared-off').

Western sea wall	Eastern sea wall
= 160 mm x 30 mm	= 160 mm x 30 mm
= 4800 mm^2	= 4800 mm^2

They then measured the straight-line distance between each weakness point and the next point that was nearest to it (i.e. its nearest neighbour). This data was tabulated and the mean distance ($\overline{D}$) was calculated for each section of the sea wall.

Weakness Point	Nearest neighbour	Distance between weakness point and its nearest neighbour (mm)
1	3	11
2	3	7
3	2	7
4	3	8
5	6	13
6	5	13
7	8	13
8	9	6
9	8	6
10	11	8
11	10	8
12	11	17
Western sea wall $\overline{D}$ =		9.75

Weakness Point	Nearest neighbour	Distance between weakness point and its nearest neighbour (mm)
1	2	17
2	1	17
3	4	19
4	5	5
5	4	5
6	5	37
7	6	56
Eastern sea wall $\overline{D}$ =		22.29

The following formula was then used to calculate a value for the Nearest Neighbour Index (R) for each section of sea wall:

$$R = 2\overline{D}\sqrt{\frac{n}{A}}$$

where n = the number of weaknesses in that section of sea wall;

and where A = the size of the section of sea wall

Western sea wall

$R = 2 \times 9.75 \sqrt{\frac{12}{4800}}$

$R = 19.5 \sqrt{0.0025}$

$R = 19.5 \times 0.05$

R = 0.98

Eastern sea wall

$R = 2 \times 22.29 \sqrt{\frac{7}{4800}}$

$R = 44.58 \sqrt{0.0015}$

$R = 44.58 \times 0.04$

R = 1.78

In this example, as the R value for the western sea wall is less than the R value for the eastern sea wall, the points of structural weakness in the western sea wall can be said to be more clustered than those in the eastern sea wall. Therefore, the researcher can accept their hypothesis.