GCSE to A-Level Biology Transition
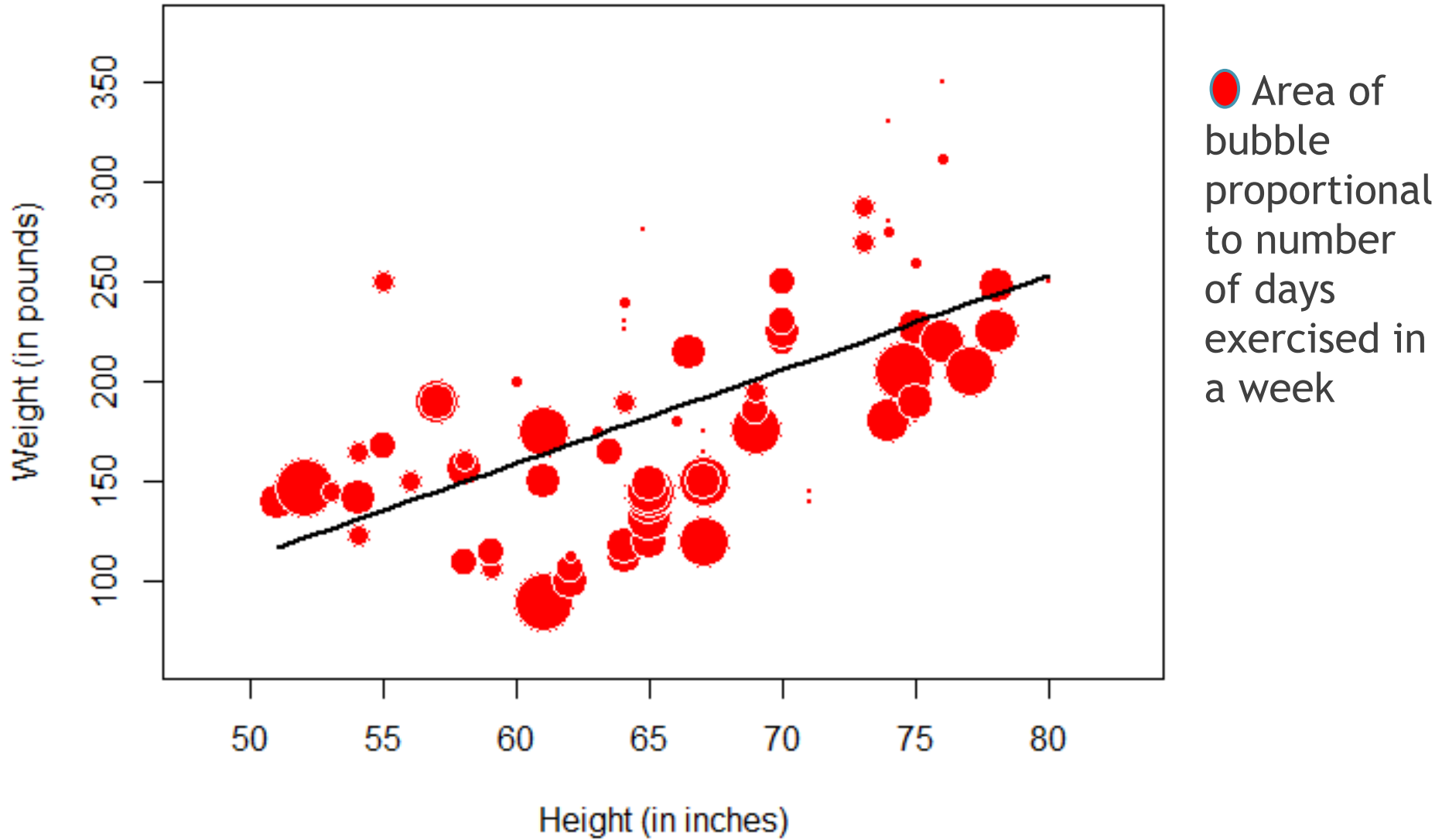
Lesson 9

Graphs

What does this graph show?

Area of bubble proportional to number of days exercised in a week

What does this graph show?

Air Quality in New York by Day
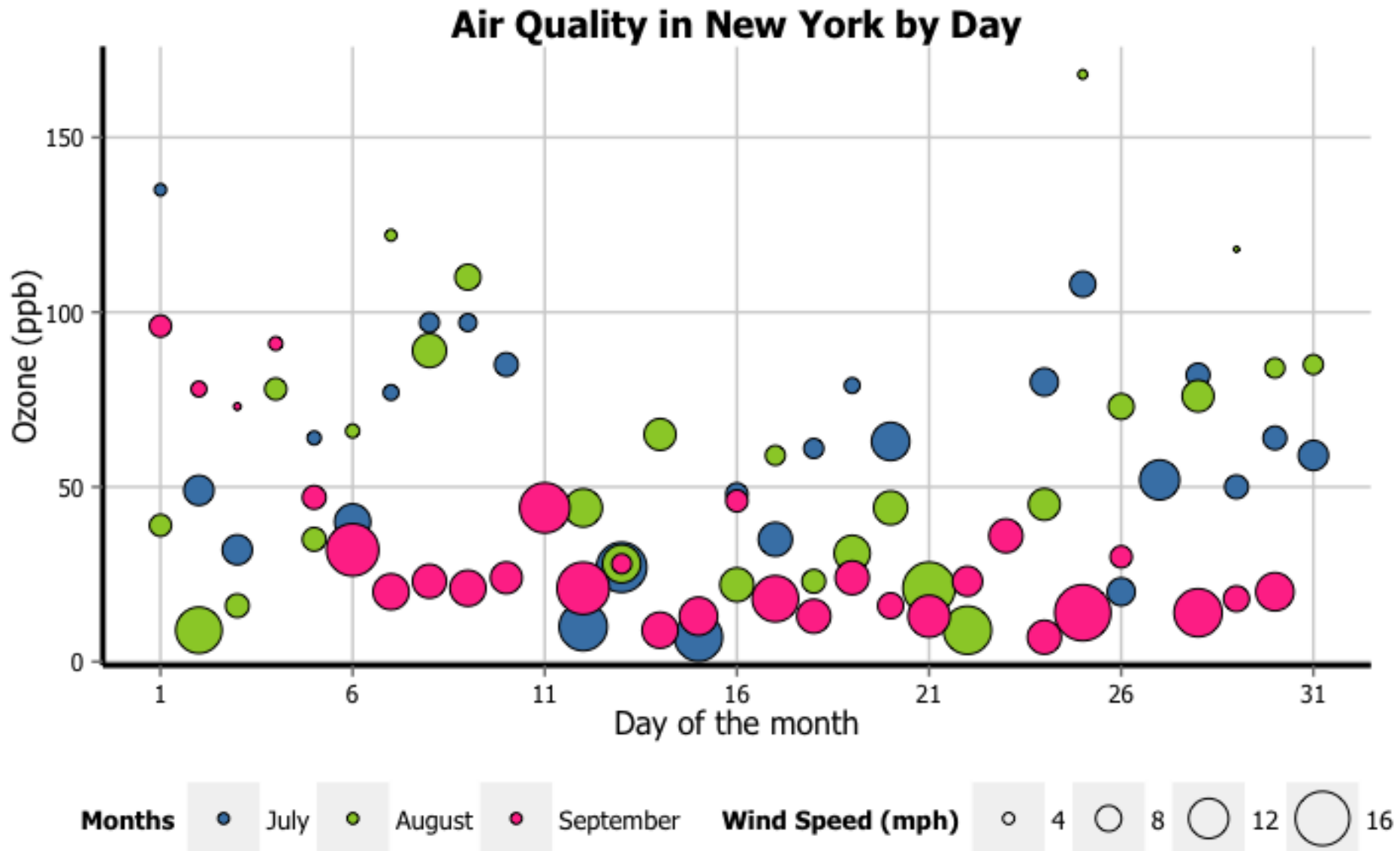
Bubble charts

▶ The graphs on the previous slides are called bubble charts and they can display information in 3 dimensions (or 4 if you use colour too as in the second chart). That means 3 sets of information about a point.

▶ For example from chart 2 on the 6th of September the wind speed was 16mph and the ozone was 35ppb.

▶ It can allow you to see if several variables could be impacting a dependent variable
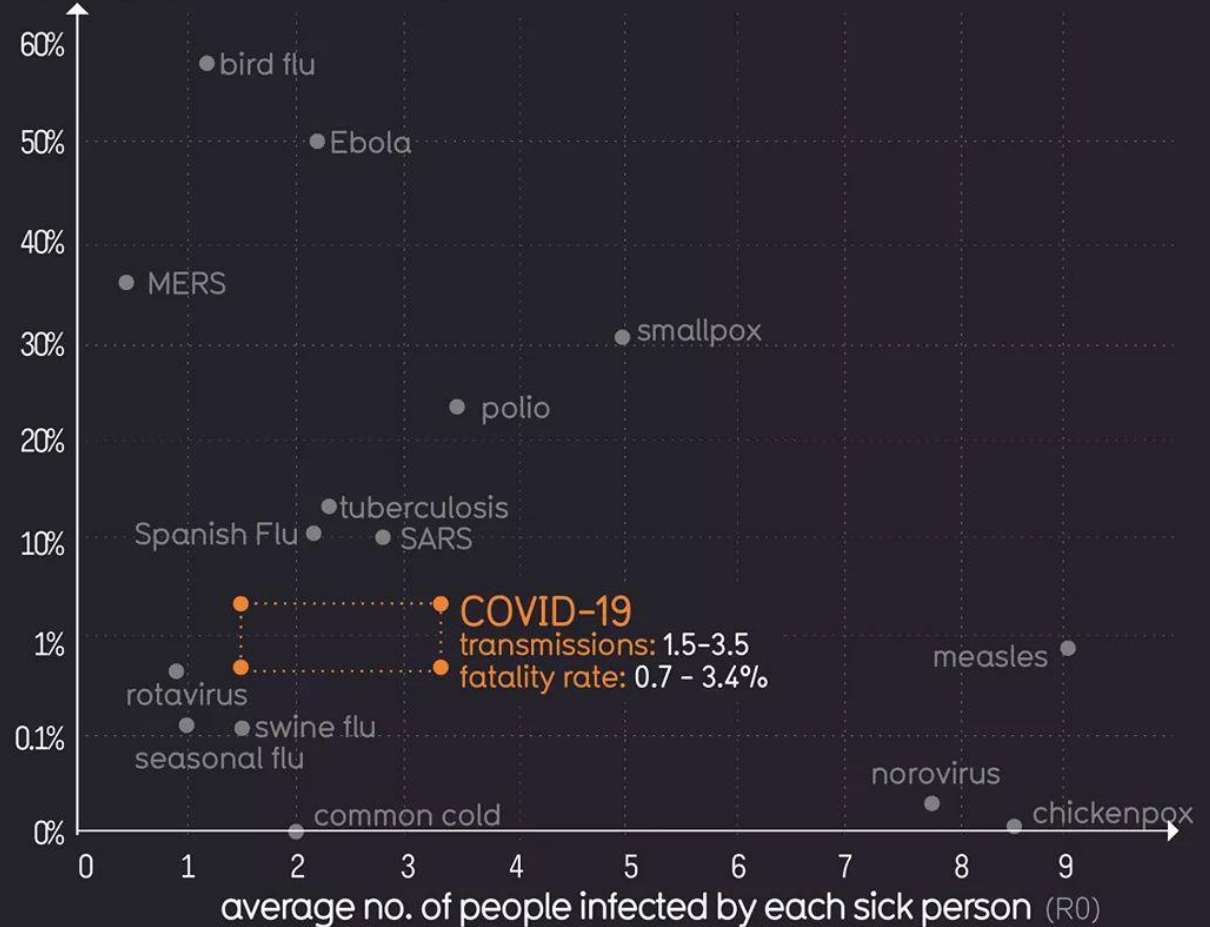
Why do we draw graphs?

Graphs are a common method to visually illustrate relationships in the data. We can use them to make comparisons and predictions.

COVID-19 #CORONAVIRUS INFOGRAPHIC DATA PACK

How Contagious & Deadly is It?
We don't fully know yet but it's in this range

% who die (CASE FATALITY RATE)

- bird flu
- Ebola
- MERS
- smallpox
- polio
- tuberculosis
- Spanish Flu
- SARS
- COVID-19 transmissions: 1.5–3.5 fatality rate: 0.7 – 3.4%
- rotavirus
- swine flu
- seasonal flu
- measles
- common cold
- norovirus
- chickenpox

average no. of people infected by each sick person (R0)

informationisbeautiful

sources: Centres for Disease Control, WHO, New York Times

Key words you need to know

- The **dependent variable** (what you measure) should be on the **Y (side) axis.**

- The **independent variable** (what you change) should be on the **X (bottom) axis.**

- If your **independent variable** is **continuous**, e.g. has any numerical value, like mass or time, then you should draw a **line graph**.

- If your **independent variable** is **discrete** (discontinuous), e.g. has a specific value, usually described by a word, like eye colour, then you should draw a **bar chart.**

- **Histograms** plot grouped quantitative data while bar charts plot categorical data. Bars can be reordered in bar charts but not in histograms.

How do I know which type of graph to use? Follow this key…

1. Is the data a percent that sums to 100% or a total amount of time?
    a.   If yes ……………………………………Pie chart
    b.   If no……………………………………....Go to #2

2. Are <u>both</u> your independent and dependent variables quantitative?
    a. If no…………………………………….... Bar graph
    b. If yes ……………………………………. Go to #3

3. Is your independent variable level <u>continuous</u> (i.e. time in years) or <u>clumped</u> into groups (i.e. 0-5 years, 6-10 years)?
    a. Continuous…………………………….. Scatter plot/line graph
    b. Clumped …….…………………………. Histogram

# Other types of graphs you should be familiar with

Pie Chart

Designed to show a percent of a whole, where the whole equals 100%. Pie charts are used to compare data, but cannot be used to see how a manipulated variable affects a responding variable. Pie charts do not show change with respect to another variable.

*Eg: Percent of time the cell spends in each phase of the cell cycle*

Bar Graph
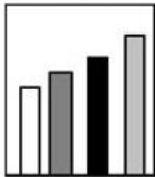
Designed to make comparisons of data. The data represented in bar graphs are not necessarily dependent on any other variables and the groupings are usually *qualitative* (i.e. grouped into categories, like blood types or colour). The bars do NOT touch.

*Eg: Comparison of the mean reaction rate for five different enzymes*

Histogram
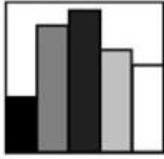
Histograms are similar to bar graphs except the data represented in histogram is usually in groups of continuous numerical (*quantitative*) data. In this case, the bars do touch. Histograms are often used to show frequency data.

*Eg: Minimum Decibels (dBA) of sound heard by 20 people*

Line Graph
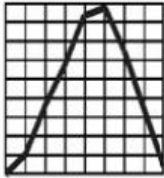
A line graph consists of a series of points plotted on the grid and then connected together point to point by a line. Line graphs are only used when both variables are quantitative. Line graphs show trends, such as how things change over time.

Eg: Average mean temperature between the years 1900 and 2000

Scatter Plot
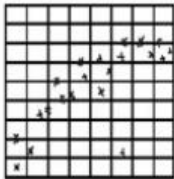
The points are plotted on the grid, but they are not joined point to point. A best fit line may be added to a scatter plot to show a trend. Line graphs are only used when both variables are quantitative. These graphs are useful for showing if a correlation exists between two variables, especially when it is not possible to alter either of the variables (i.e. in descriptive studies).

Eg: Reaction rate at various enzyme concentrations

What are the criteria for drawing a perfect graph?

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-
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What are the criteria for drawing a perfect graph?

Use pencil

✓ Independent variable on x axis, dependent on y axis.

✓ Axes labelled with variable name and units.

✓ Values on axes have an even scale and are spaced out enough that the plotted area of the graph should take up at least half of the paper provided.

✓ Points plotted accurately with a neat pencil cross to the nearest small square

✓ Line or curve of best fit following the trend or plotted points (clear anomalies not included in your line)

✓ Appropriate title saying what the graph shows