2.3 Health, lifestyle and cancer

Name: _____ Class: _____ Date: _____ **Total: 15 marks**

KEY WORDS Risk factors

Objective

Define health, connect risk factors with causal mechanisms, distinguish benign and malignant tumours, and interpret risk data. Original questions for spec statements 4.2.2.5–4.2.2.7.

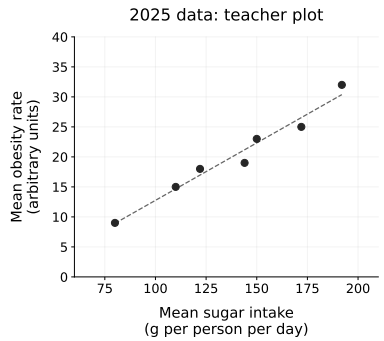
1 Key knowledge and worked examples

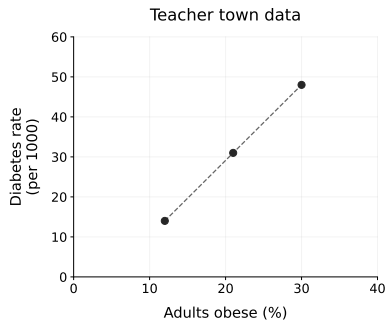
Health is physical and mental well-being. Communicable and non-communicable diseases, diet, stress and life situations can affect both. Disease interactions include immune defects increasing infection risk, some viruses triggering cancers, immune reactions following infection triggering allergies, and severe physical illness contributing to depression.

A **risk factor** is linked to an increased disease rate. It may be lifestyle or a substance in the body/environment. Increased risk does not mean every exposed person develops the disease.

Factor	Established risk / effect
Diet, smoking, exercise patterns	Cardiovascular disease
Obesity	Type 2 diabetes
Alcohol	Liver damage; brain effects
Smoking	Lung disease; lung cancer
Smoking / alcohol during pregnancy	Harm to unborn babies
Carcinogens, including ionising radiation	Cancer

Correlation and cause: a scatter plot shows an association, not its cause. An established causal risk factor such as obesity can contribute to Type 2 diabetes, but one three-town association does not isolate that effect from age, diet, activity, sampling or chance. Prior scientific evidence and the particular dataset are different sources of evidence. A known mechanism does not make every observed association causal.





Teacher redraw, not the original exam figure: left uses the exact AQA June 2025 Q02.2 table; right uses the teacher-authored sheet Q3.2 data. Dashed lines show fitted trends, not measured paths or proof of cause. The seven-country vertical axis is in **arbitrary units**, not percentages; the three-town diabetes axis is **per 1000**, not percent.

Reading a scatter plot: identify each axis and unit; use one point per paired observation; describe the direction with both variable names. A line of best fit represents the overall pattern and need not pass through every point or the origin. Original 2025 Q02.2 [4] requires a suitable vertical scale/label, five additional correct plots and a line of best fit. Q02.1 [1] accepts **Type 2 diabetes** as an obesity-related disease; do not give Type 1.

Worked teacher-town data (sheet Q3.2): A = 12% obese / 14 per 1000 diabetes; B = 21% / 31; C = 30% / 48. As the percentage obese rises, diabetes rate rises: positive correlation. Support the trend with two values using units.

$$R = \frac{d_C}{d_A}$$

$$R = \frac{48 \text{ per } 1000}{14 \text{ per } 1000} = 3.43$$

The rate is about **3.4 times** as high, not "roughly double". The absolute increase is 34 cases per 1000, not 34 percentage points. Obesity is an established causal risk factor for Type 2 diabetes, but these three towns alone cannot prove that obesity caused the difference in their rates. Other factors and sampling must be considered.

Checking a survey claim (sheet Q3.3): compare similar groups and account for smoking, diet, exercise and age; these may affect both exposure and disease. Check sample size, selection and representativeness so a small/biased group does not stand for everyone. Check whether exposure preceded disease and whether findings repeat. Seek a plausible tested mechanism and independent review, but neither plausibility nor peer review alone proves causation. Each answer needs a check **and its reason**.

Cancer results from cell changes leading to uncontrolled growth and division. **Benign** tumours remain in one area, usually within a membrane, and do not invade other tissues. **Malignant** tumour cells invade nearby tissues and spread in blood to form secondary tumours. Compare containment/invasion and spread as separate features; size alone does not identify malignancy.

Smoking mechanism (sheet Q3.1): tobacco smoke contains **carcinogens**. These can damage/mutate DNA in lung cells; changes affecting division control can lead to uncontrolled division and malignant tumours. This explains increased risk, not certainty for every smoker or every mutation. Some cancers also have inherited genetic risk factors.

2 Practice

2.1 Define health. [1]

2.2 Give one proven causal risk factor for Type 2 diabetes. [1]

2.3 State two differences between benign and malignant tumours. [2]

3 Exam-style questions

3.1 Explain how smoking causes lung cancer, naming the substances involved. [3]

3.2 Table: % of adults obese vs rate of Type 2 diabetes in three towns.

Town	% obese	Diabetes rate per 1000
A	12	14
B	21	31
C	30	48

(a) Describe the pattern. [2]

(b) Explain whether obesity is a cause of Type 2 diabetes. [2]

3.3 A newspaper claims a new energy drink "causes heart disease" from a survey. Give two checks needed before accepting causation. [4]

Solutions

2.1 The state of physical and mental well-being.

2.2 Obesity.

2.3 Benign is contained in one area within a membrane while malignant invades neighbouring tissues; malignant spreads in the blood to form secondary tumours, benign does not.

3.1 Cigarette smoke contains carcinogens; these can damage/mutate DNA in lung cells; changes affecting division control can lead to uncontrolled division and malignant tumours.

3.2 (a) As the percentage obese rises, the diabetes rate rises – a positive correlation; supporting data, e.g. 14 per 1000 in A versus 48 per 1000 in C. The ratio is $48/14 = 3.43$, not roughly double. (b) Obesity is an established causal risk factor for Type 2 diabetes, but this three-town table alone cannot prove causation or rule out age, lifestyle, sampling or chance.

3.3 Teacher-authored key: any two checks with a linked reason, 2 marks per pair, maximum 4. Examples: account for smoking/diet/exercise/age (1), because these may explain both drink choice and disease (1); check a large representative sample (1), because small or biased samples may mislead (1); establish exposure before disease (1), because a later behaviour cannot explain an earlier disease onset (1); seek repeated independent evidence and a tested mechanism (1), because one survey/plausible story alone cannot establish cause (1). Peer review improves scrutiny but does not itself prove cause.