HIGHER

# H14-30min Crude and Standardised Rates: 30-minute Pack

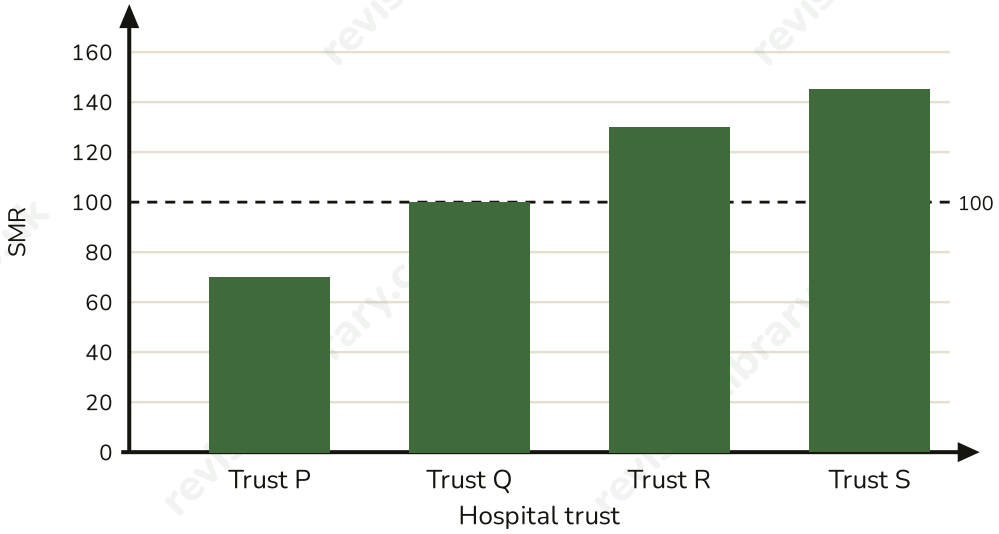
Total Marks

EDEXCEL 1ST0 · Calculator allowed · about 30 minutes

Name: _____ Date: ____ / ____ / _____

**Answer ALL questions. Show all your working.**

**1** The bar chart shows the SMR for four hospital trusts, P, Q, R and S, in the same year. The dashed line shows the reference value of SMR = 100.




**(a)** Write down the SMR of Trust Q. **(1)**

.....

**(b)** Write down which trust has the highest SMR. **(1)**

.....

**(c)** Trust P has an SMR of 70. Interpret what this means for Trust P. **(2)**

**(d)** Explain why comparing the raw number of deaths at each trust, instead of their SMRs, could give a misleading picture of how well each trust is performing. **(2)**

**(Total for Question 1 is 6 marks)**

**2** The table shows the age-band populations (in thousands) of three small towns. Using the standard population's age-specific death rates (Under 40 = 1 per 1000, 40-64 = 5 per 1000, 65 and over = 50 per 1000), complete the table by calculating the expected number of deaths in each town.

| Town | Under 40 (000s) | 40-64 (000s) | 65 and over (000s) | Expected deaths |
|---|---|---|---|---|
| Hollow Green | 7 | 3 | 2 | ? |
| Marsh End | 4 | 4 | 4 | ? |
| Top Fenwick | 2 | 2 | 6 | ? |

**(Total for Question 2 is 3 marks)**

**3** Sandmoor district also has a population of 20,000, split by age band as shown.

| Age band | Population | Standard age-specific death rate (per 1000) |
|---|---|---|
| Under 40 | 5,000 | 1 |
| 40-64 | 7,000 | 5 |
| 65 and over | 8,000 | 50 |

Sandmoor recorded 396 actual deaths that year.

**(a)** Calculate the total expected number of deaths in Sandmoor. **(3)**

.....

**(b)** Calculate the SMR for Sandmoor. **(2)**

.....

**(c)** Interpret the SMR value found in part (b). **(1)**

**(Total for Question 3 is 6 marks)**

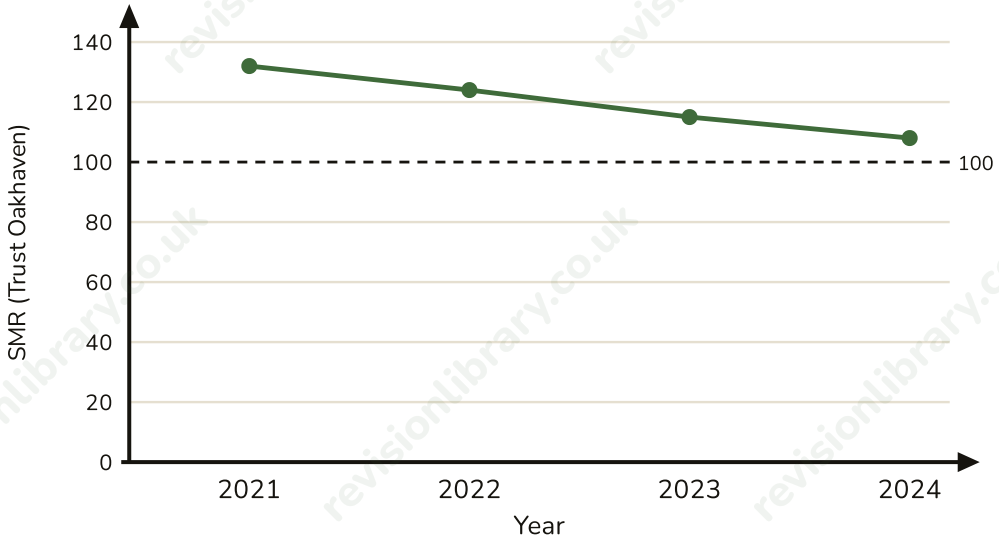
**4** A local newspaper reports: 'Greenfield Hospital has an SMR of 130, while Riverside Hospital has an SMR of 95, so Greenfield must be a worse hospital than Riverside.' Greenfield specialises in treating complex, high-risk cases referred from other hospitals, while Riverside mainly treats routine, lower-risk cases.

**(a)** Evaluate the newspaper's claim, explaining one reason why comparing SMRs alone may still not give a completely fair comparison between the two hospitals. **(3)**

**(b)** Explain why, despite this limitation, the SMR is still generally a fairer way to compare hospitals' mortality than using crude death rates or raw numbers of deaths. **(2)**

**(Total for Question 4 is 5 marks)**

**5** The line graph shows the SMR for Trust Oakhaven each year from 2021 to 2024. The dashed line shows the reference value of SMR = 100.




**(a)** Write down the SMR for Trust Oakhaven in 2023. **(1)**

.....

**(b)** Describe the trend in Trust Oakhaven's SMR from 2021 to 2024. **(1)**

**(c)** By 2024, is Trust Oakhaven's mortality still higher than expected for its patients' age structure? Justify your answer using the graph. **(2)**

**(d)** Suggest one possible reason for the improving trend shown in the graph. **(1)**

**(Total for Question 5 is 5 marks)**

**6** Millfield has a population of 40,000, split by age band as shown.

| Age band | Population | Standard age-specific death rate (per 1000) |
|---|---|---|
| Under 40 | 10,000 | 1 |
| 40-64 | 18,000 | 5 |
| 65 and over | 12,000 | 50 |

Millfield recorded 840 actual deaths that year.

**(a)** Calculate the crude death rate for Millfield. **(2)**

.....

**(b)** Calculate the expected number of deaths for Millfield, using the standard population's age-specific rates. **(3)**

.....

**(c)** Calculate the SMR for Millfield. **(2)**

.....

**(d)** Evaluate what the crude rate and the SMR together suggest about mortality in Millfield, and explain why relying on the crude rate alone would give an incomplete picture. **(3)**

.....

**(Total for Question 6 is 10 marks)**

# Mark scheme · H14-30min Crude and Standardised Rates: 30-minute Pack

## Question 1

- (a) **B1** 100 cao
- **(a) Answer: 100**
- (b) **B1** Trust S cao
- **(b) Answer: Trust S**
- (c) **B1** identifies that Trust P had fewer deaths than expected, given its patients' age structure, oe
- (c) **B1** quantifies this as 30% fewer deaths than expected, oe
- **(c) Answer: Trust P recorded 30% fewer deaths than would be expected, given the age structure of its patients.**
- (d) **B1** raw death counts depend on how many patients each trust treats and their age/case mix, so a trust treating more patients or older/sicker patients would have more deaths anyway, oe
- (d) **B1** the SMR adjusts for these differences by comparing observed deaths with the number expected for that trust's own patient population, allowing a fairer like-for-like comparison, oe
- **(d) Answer: Raw death counts depend on how many patients a trust treats and their age or case mix, so a trust with more or older patients would naturally record more deaths, even with equally good care. The SMR adjusts for this by comparing observed deaths with the number expected for that trust's own patients, giving a fairer comparison.**

## Question 2

- **B1** Hollow Green = 122 cao
- **B1** Marsh End = 224 cao
- **B1** Top Fenwick = 312 cao
- **Answer: Hollow Green 122; Marsh End 224; Top Fenwick 312**

## Question 3

- (a) **M1** 5x1 + 7x5 + 8x50, oe
- (a) **M1** 5 + 35 + 400, oe
- (a) **A1** 440 cao
- **(a) Answer: 440**
- (b) **M1** 396 / 440 x 100, oe (ft their (a))
- (b) **A1** 90 cao
- **(b) Answer: 90**
- (c) **B1** Sandmoor had 10% fewer deaths than expected, given its age structure, oe
- **(c) Answer: Sandmoor recorded 10% fewer deaths than would be expected, given its age structure.**

## Question 4

- (a) **B1** identifies that SMR only adjusts for age (and sex) structure, not for other factors that affect mortality risk, oe
- (a) **B1** explains that Greenfield treats more complex/high-risk referred cases, which could raise its SMR even with equally good or better care, so the claim may be unfair, oe
- (a) **B1** concludes that the claim is not fully justified/cannot be confirmed from SMR alone, oe
- **(a) Answer: The claim is not fully justified. SMR only adjusts for age (and sex) structure, not for other factors like case complexity. Greenfield treats more complex, high-risk referred cases, which could raise its SMR even if its care is just as good as Riverside's, so comparing SMRs alone does not prove Greenfield is a worse hospital.**
- (b) **B1** SMR at least adjusts for age (and sex) structure, which crude rates and raw counts do not, oe
- (b) **B1** so SMR removes one major source of unfair comparison (differing patient age profiles), even if other factors like case-mix still need to be considered, oe
- **(b) Answer: SMR still adjusts for the patients' age (and sex) structure, which crude death rates and raw counts do not. This removes one major source of unfair comparison, even though other factors like case complexity may still need to be considered separately.**

## Question 5

- (a) **B1** 115 cao
- **(a) Answer: 115**
- (b) **B1** the SMR has steadily decreased/fallen each year, moving closer to 100, oe
- **(b) Answer: Trust Oakhaven's SMR has steadily decreased from 2021 to 2024, moving closer to 100.**
- (c) **B1** Yes cao
- (c) **B1** the 2024 SMR (108) is still above 100, meaning about 8% more deaths occurred than expected, even though the gap has narrowed considerably since 2021, oe
- **(c) Answer: Yes. The 2024 SMR of 108 is still above 100, meaning around 8% more deaths occurred than expected, although the gap has narrowed a lot since 2021 (SMR 132).**
- (d) **B1** any sensible reason, e.g. improvements in patient care/treatment protocols, better staffing levels, or changes in the types of patients treated, oe
- **(d) Answer: Trust Oakhaven may have introduced improvements to patient care or treatment protocols over this period.**

## Question 6

- (a) **M1** 840 / 40000, oe
- (a) **A1** 21 cao
- **(a) Answer: 21 per 1000**
- (b) **M1** 10x1 + 18x5 + 12x50, oe
- (b) **M1** 10 + 90 + 600, oe
- (b) **A1** 700 cao
- **(b) Answer: 700**
- (c) **M1** 840 / 700 x 100, oe (ft their (b))
- (c) **A1** 120 cao
- **(c) Answer: 120**
- (d) **B1** recognises that the crude rate (21 per 1000) alone has no benchmark, so it is impossible to tell whether this is high or low without further information, oe
- (d) **B1** the SMR of 120 shows that, once Millfield's age structure is accounted for, it had 20% more deaths than expected, oe
- (d) **B1** concludes that standardisation reveals a genuine excess in mortality that the crude rate alone could not show, since age differences could otherwise mask or wrongly explain the raw figures, oe
- **(d) Answer: The crude rate of 21 per 1000 alone cannot be judged as high or low without a benchmark. The SMR of 120 shows that, once Millfield's age structure is taken into account, it actually had 20% more deaths than expected. This reveals a genuine excess in mortality that the crude rate alone could not show, since age differences could otherwise mask or wrongly explain the raw figures.**