

# Specimen Paper IIA Questions

## Specimen Paper 1 (updated December 2015)

- change to word count limit guidance updated September 2017

You are working in a public health department covering a population of 250,000. Your area has a very deep water-filled gorge, spanned by a suspension bridge that is over 75 metres high. Every year there are a number of suicide jumps from the bridge with a case fatality of 95%. The director of a national charity which counsels people at high risk of suicide has written to you requesting that action is urgently taken to erect a barrier at the bridge. The director points out the high case fatality and states that there is strong evidence that preventing access to lethal means is a highly effective measure to reduce acts of suicides. You have recently read the following published paper:

**Sinyor M, Levitt AJ. Effect of a barrier at Bloor Street Viaduct on suicide rates in Toronto: natural experiment. BMJ 2010;341:c2884. doi:10.1136/bmj.c2884.**

Note to candidates: The paper has been reduced in length by removing:

- The abstract
- The strengths and limitations section in the discussion

### Question 1

Using a critical appraisal approach, **in approximately 600 words**, provide the strengths and limitations of this study. Candidates are expected to write these in prose not bullet points.

[Please note that the strengths and limitations are not necessarily equal in number.

There is a word count limit for your response to Question 1.

Examiners will stop marking if the word count is exceeded by more than 10%

(i.e. 660 words)].

(50% of marks)

### Question 2

In the analysis the researchers carried out  $t$  tests for continuous variables and  $\chi^2$  tests for categorical variables. Explain what is meant by categorical and continuous variables.

(10% of marks)

### Question 3

Outline in detail the key points you would include in a letter of response to the national charity. Include consideration of the main findings of the published BMJ paper as well as relevant local policy issues.

(20% of marks)

### Question 4

A decision is made to consider safety measures at the bridge for the prevention of suicide by jumping. Who would you invite to join a working group to discuss this and what information would you prepare ahead of the meeting to present to the working group?

(20% of marks)

## Key points

### Question 1 (50% of marks)

The expectation is that the answer will be written in prose and not in bullet point format. However, for brevity the key points are given here in bullet point format.

Candidates should note that the strengths and limitations given here are not necessarily the same as those in the published article.

### The following would be required to pass:

#### Strengths

- This study is based on a before and after 'natural experiment' which offers the only real opportunity to test the effects of the construction of bridge barriers in the prevention of suicide.
- As the bridge with the second largest number of suicides worldwide (Golden Gate Bridge the highest) it has a high number of suicides and therefore with data from several years offers the opportunity to test the hypothesis that barrier construction will prevent suicides by jumping.
- Coroner's records were used as the single source of information about all suicides, the means and location. Postcode information was added to enable place of residence to also be examined.
- By using the Coroner's data the investigators used a standard definition of death by suicide (that used by the Coroner's office) as being a "high degree of probability."
- It is likely that all deaths likely to be due to suicide were identified at the Bloor Street Viaduct since it was a bridge over a road and not water where bodies might disappear if the jump was unwitnessed.
- All suicides in Ontario were selected for inclusion in the study, which provided a large dataset with which to test the impact of the barrier at the bridge on potential reciprocal increases in suicides by jumping at other locations and by other means.
- The data were analysed appropriately using poisson regression (for rare events) and comparisons of t-tests and chi-square tests with two sided P-values (except for the comparison of place of residence – see below).
- Although there was no power calculation and no justification for the period of time examined prior to the barrier construction (it was not possible to extend the time after the barrier construction) this seems like a reasonable length of time for sufficient deaths for the analysis; this was borne out by the fact that most comparisons showed statistically significant differences.  
(Note: credit will be given if this point is instead mentioned under limitations since it can be interpreted as either a strength or a limitation).

#### Limitations

- Despite the relative comprehensiveness of the coroner's records, it is possible that suicide rates by all causes were overestimated or underestimated over time due to incompleteness of records, which is likely to have been more of a problem in the earlier period.
- It is possible that whilst a standard definition of death was used changes in coroners over time may have led to changes over time in how this definition was applied.

- The coroner's verdict might be prone to bias because people found dead beneath certain bridges or after falling from any bridge or building are more likely to have been ruled as having died by suicide than by causes such as homicide or unintentional death/accident.
- Due to the large number of deaths from other causes, such as accidents, homicide and undetermined causes, it was not possible for the researchers to examine all these deaths to exclude the possibility of possible suicides not having been attributed to this cause which is more likely to affect deaths by other means than by jumping.
- This is effectively an ecological study and the investigators were therefore not able to take into account other factors which may have affected the suicide rate over this time period, for example, economic variability and the availability of services which may have impacted on the care of people in distress. One factor mentioned was the possible effect of the publicity surrounding the construction of the barrier which may have had the effect of pointing out alternative locations to jump from.
- Although there was no power calculation and no justification for the period of time examined prior to the barrier construction (it was not possible to extend the time after the barrier construction) this seems like a reasonable length of time for sufficient deaths for the analysis; this was borne out by the fact that most comparisons showed statistically significant differences (credit will be given if this point is instead mentioned under strengths since it can be interpreted as either a strength or a limitation).

**Extra credit would be attracted by discussion of the following points:**

- The study assumed that the population growth was linear for the time period 1996-2001 and 2001-2006. If the population growth had not been linear it may have affected the estimated rates.
- In the analysis two-sided statistical tests were used for all comparisons except the one relating to the area of residence. Although a justification for a single sided test was given this is nevertheless an unusual decision and based on a decision for which no evidence was given.
- The use of coroners' records for this study only provided data on completed suicides rather than attempted suicides. Any additional findings on changes to attempted suicides (if possible to discover) might strengthen the findings of this paper.

**Question 2 (10% marks)**

A categorical variable is any variable made up of data that can be divided into groups (categories) e.g. sex, race, socioeconomic status.

Continuous variables represent measurements on a continuous scale, e.g. blood pressure, height, weight, income, age.

**Question 3 (20% of marks)**

Because candidates have been asked to outline points they can do this in bullet point format, however, single word answers will not be sufficient and an explanation of the each point will need to be given to attract the full marks.

- Use of appropriate language for correspondence.
- Thank the charity for their interest and acknowledge the local problem.

- Acknowledge the often public nature of a death by jumping (distress to witnesses who can be traumatically affected).
- Give a brief summary of findings highlighting the key points (not just copying the answer from the paper) and results: consider how applicable this is to the local situation, any key limitations, discuss any practical issues re implementation.
- Consider paying more attention to the results of other favourable studies, if your local bridge is regarded as a 'suicide magnet.'
- Point out that other interventions have had a major impact (e.g. restriction on paracetamol pack sizes).
- Suggest undertaking an audit of all suicide sites and methods, not just at the suspension bridge e.g. railways.

#### **Question 4 (20% of marks)**

Given the nature of the question this can be a bullet point list or series of short answers.

#### **Consider inviting:**

Identify key players and the importance of engaging appropriate professionals and other interested parties/how to engage them.

Chair of group – possibly DPH or PH consultant; structural engineer; architect; senior police officer (negotiating team); ambulance; local psychiatric unit; A&E; trustee/manager of the bridge; local government representative; local (or national if none locally) third sector organisation reps (preferably more than one and suggest including the director of the national charity who wrote the original letter).

Recognise the challenge of having a manageable sized group to take work forward/versus engaging all interested parties. One suggestion might be to have a 'workshop' to start the work/gather ideas about local issues then identify a smaller working group to develop a possible action plan etc.

#### **Preparing for the meeting:**

- Write a short briefing paper outlining the context and the key findings from the paper for the meeting.
- Include any relevant local information.
- Give the results of any local audits including suicides from other causes.
- Draft a set of terms of reference for the group.
- Decide on the suggested timescale for the work of the group.

## Specimen Paper 2 (updated December 2015)

You are a specialist in a public health team in a town with high levels of deprivation and a relatively low-skilled workforce.

A physician with an interest in diabetes at your local hospital sends you a copy of this paper and wishes to know if the findings can be used to target health promotion activity in the area, specifically aimed at people of lower socio-economic status.

**S Stringhini et al. Contribution of modifiable risk factors to social inequalities in type 2 diabetes: prospective Whitehall II cohort study. BMJ 2012;345:e5452doi (pub 21 August 2012)**

Note to candidates: The paper has been reduced in length by removing:

- The abstract
- The strengths and limitations section in the discussion

### Question 1

Using a critical appraisal approach, **in approximately 600 words**, provide the strengths and limitations of this study. Candidates are expected to write these in prose not bullet points.

[Please note that the strengths and limitations are not necessarily equal in number. There is a word count limit for your response to Question 1. Examiners will stop marking if the word count is exceeded by more than 10% (i.e. 660 words)].

(50% of marks)

### Question 2

The paper refers to use of a Cox regression model in the analysis. When should this technique be used and what are the underlying assumptions of this model?

(10% of marks)

### Question 3

Write a short (300 words approximately) letter of response to the physician with an interest in Diabetes.

(30% of marks)

### Question 4

A decision is made to develop a health promotion programme with the aim of reducing the incidence of type 2 diabetes in your health area. List (in bullet points) the key agenda items for the first meeting of the group.

(10% of marks)

## Key points

### Question 1 (50% of marks)

The expectation is that the answer will be written in prose and not in bullet point format. However, for brevity the key points are given here in bullet point format.

Candidates should note that the strengths and limitations given here are not necessarily the same as those in the published article.

### Strengths:

#### The following would be required to pass:

- The study population is a clearly defined, very large (i.e. over 7,000) and very well characterised cohort of individuals who have been follow-up for many years.
- Extensive detailed information about socio-behavioural factors and biological markers has been collected on repeated occasions since recruitment.
- The nature of the repeated data collected enabled the repeated measures of exposure to potential explanatory factors for the relationship between socio-economic status (SES) and risk of type II diabetes to be assessed more completely and to explore the impact of change in risk factors than if only baseline information was available.
- Participation was high and <20% of the cohort were excluded from this analysis on the basis of missing data although 20% of individuals has missing values imputed for at least one risk factor in the main analysis; for a proportion of the individuals with more missing data we can reasonably assume this will have arisen from losses to follow-up over time which is a common occurrence in longitudinal cohorts for this duration.
- An objective test was performed for diabetes (oral glucose tolerance test), which should be a valid and reliable assessment. This is also true for cholesterol and triglyceride measurements.
- Follow up in the study was over a mean of 14.2 years. This provided enough time for a large number of people to develop type 2 diabetes (n=818).

#### Extra credit would be attracted for discussion of the following strengths:

- Three different sensitivity analyses were conducted: first on various subgroups in the dataset; second on the definition of socio-economic status by using education instead of employment status; and third to explore the effects of missing data. The main findings were robust to the various different assumptions made.
- The approach to the statistical modelling and the presentation of the results made the impact of different risk factors explicit thereby allowing the impact of each set of factors to be made clear.

### Limitations:

#### The following would be required to pass:

- As the findings were from a very specific occupational group, they may not fully apply to the general population, which also includes people not in paid employment and also those in less secure employment than the civil service.
- A further disadvantage of this particular occupational cohort is that it lacks ethnic diversity (very high proportion (91%) of individuals were classified as white) and so any impacts of ethnicity could not be reliably assessed. The classification of ethnicity was limited to white/non-white in the analysis by ethnicity.

- Despite a high response and return for successive phases of the longitudinal study data could not be included from all participants present at baseline (which was at phase 3 of the overall study for this particular analysis). Importantly individuals from the lower socio-economic group were more likely to be excluded and may have led to an under-estimate of the effects of the risk factors associated with lower SES.
- Health behaviours were self-reported without external validation, for example cotinine levels to validate reports of smoking behaviour. This method of data collection is prone to information bias which may lead to under-reporting of unhealthy behaviours and under estimation of the effects of such behaviours.
- Exposure measures were crudely categorised e.g. data on ex-smokers, and duration and frequency of smoking were not included in the analysis, ethnicity was dichotomised (although with so few non-whites in the study population it is unlikely that this could have been examined in more detail) which may have led to residual confounding.
- Not all the exposures were assessed at each time point and there were changes in how some of them were assessed over time.
- Whilst repeated measures of other exposures of interest were included only the baseline measure of socio-economic (SES) status was used. Thus the impact of any changes in SES over time could not be evaluated.
- The same was true of a family history of diabetes which might also have changed over time as parents and siblings may have developed diabetes over the period of study.

**Extra credit would be attracted for discussion of the following points:**

- Some measures of exposure which were available as continuous measures were classified into categorical variables with an inevitable loss of statistical power.
- No mention was made of losses to follow-up through deaths which seems highly surprising for a cohort of this age followed for an average of 14 years.
- The cohort consisted of a large proportion of men and there was SES patterning in risk factors between men and women.

**Question 2 (10% of marks)**

In prospective studies, when individuals are followed over time, the values of some of the covariates may change with time. Covariates can thus be divided into fixed (e.g. sex or race) and time-dependent, if the difference between their values for two different subjects changes with time (e.g. serum cholesterol or weight). Lifestyle factors and physiological measurements are usually time-dependent. Cox regression analysis can incorporate time-dependent covariates, and this is why it is used here.

Cox regression (or proportional hazards regression) is a method for investigating the effect of several variables over the time a specified event takes to happen. Cox models the survival (time-to-event) probability. It does NOT however assume knowledge of absolute risk; rather, it estimates relative risk.

Proportional hazards assumption: the Cox proportional regression model assumes that the effects of the predictor variables are constant over time.

### **Question 3 (30% of marks)**

Use appropriate language for professional to professional correspondence. Thank them for their interest and acknowledge the extent of the problem of type 2 diabetes (extra marks for being able to give local figures for information).

Give brief summary of findings, highlighting the key points (not just re-doing the critical appraisal) – results, any key limitations, any practical issues re implementation.

Demonstrate an understanding of the increasing importance of the problems arising from type 2 diabetes and the need to tackle this issue.

Give an outline of how findings could be applied locally.

Be pragmatic about how this might be implemented – do not raise unrealistic expectations. Recognise what can practically be delivered in a local setting.

#### **Extra credit would be attracted for discussion of the following points:**

Candidates may suggest that this paper does not contribute much to the evidence-base over and above what is known. There is enough literature already available to know that physical inactivity, poor diet, obesity, smoking, are important risk factors, with higher prevalence in low SES, hence tackling these in low SES groups is important to prevent the unequal burden of type 2 diabetes.

The difference in the % of the association between SES and diabetes that can be explained by these factors is not what determines whether health promotion activities should be developed or not. This does of course not detract from the scientific importance of the paper, but the contribution regarding this question is more limited.

On the other hand, there are still areas where the knowledge is scarce. In order to prioritise resources and better target health promotion activities it would be more important to know which segment of the population would benefit more, e.g. to know whether an intervention among children/young adults would yield better results than among adults.

### **Question 4 (10% of marks)**

- Membership
- Welcome and introductions
- Briefing paper outlining the context and giving the key findings from the BMJ paper.
- Terms of reference for the group
- Identifying population needs and key areas to target
- Resources available and additional resources required
- Suggested timescale for the work of the group
- Communications strategy
- Summary of action points
- Future meetings and working arrangements

The key points for this updated version of the specimen paper have been developed with the involvement of members of the Specialty Registrars Committee, Faculty of Public Health. The Faculty of Public Health is grateful for their helpful contribution.