Faculty of Public Health

of the Royal Colleges of Physicians of the United Kingdom

Working to improve the public's health

PART A EXAMINATION FOR MEMBERSHIP OF THE FACULTY OF PUBLIC HEALTH

Of the Royal Colleges of Physicians of the United Kingdom

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EXAMINATION QUESTIONS WITH EXAMINERS' KEY POINTS AND COMMENTS

N.B. Please note that these are key points, not model answers

Paper IA

Question 1

Describe how you would undertake a formal survey to determine the prevalence of angina in a local area of a developed country (population 100,000), for example the United Kingdom.

KEY POINTS

Define aims and objectives of the survey.

Decide on resources (investigators with appropriate expertise as well as purely financial) available to find prevalence – need to balance 'quick and dirty' approach with more accurate formal epidemiological study.

Carry out literature search and scoping to identify appropriate methods and to see what has taken place in the local area or similar before, in case this represents a useful model.

Define population to be studied, e.g. age group, sex, etc. Provide a justification for each criterion used to define the population.

Decide population base and sampling frame, e.g. from GP practices with age/sex register.

Define a 'case' and discuss problems of definition and case finding.

Decide sampling method and sample size, with rationale based on expected precision or CI width.

Decide how to assess sample for possible caseness, e.g. review of GP notes, interview of sample of population or postal questionnaire, medical examination of sample. If questionnaire, which is to be used or should a new one be designed? (Excellent candidates might include references to validated questionnaires such as the Rose angina questionnaire and discuss that they may be less valid in women compared to men).

Pilot and validate questionnaire (if applicable)

Assess any ethical issues e.g. need for research ethics permission? Should those discovered as having angina be offered treatment? Can resources cope with this?

Include reporting to official bodies, dissemination and feedback to community as part of planning.

Good candidates might refer to the advantages of including community members and other stakeholders in the design process.

COMMENTS

This question was generally quite well answered. Several candidates scored highly by mentioning all or many of the steps involved in conducting a formal population-based prevalence survey where data were collected from members of a population or from documented medical sources.

Relevant steps were: define the aims; identify resources and the implications of limited resources; stakeholder involvement; conduct literature search to identify what is already known, how such studies have been conducted in the past and identify validated questionnaires to identify cases of angina (of which there are several); find local information sources which may help; define the study population (including only particular age groups for example); identify a sampling frame; define 'caseness' and problems attaching to this; decide sampling method, mentioning need for sample size calculation; decide how to identify cases (pop survey, case note survey, med exam); decide how to collect the data; comment on analysis; consider ethical issues; dissemination of results. It was not necessary to mention all these steps to score highly.

Particularly crucial issues were deciding on whether case definition was from clinical records or self-report from questionnaires, and if the latter, the need for sampling to make the study practicable. Candidates who concentrated on collecting data from medical sources were marked on the presence or absence of relevant issues, for example, if data were used from cardiology clinics and all data were available directly, then discussion of sampling was unnecessary. Since there is no unique 'correct' way of doing what was asked, a discussion of the pros and cons of various aspects (e.g. different sampling frames, different ways to collect the data), and an awareness that this would crucially affect the result, scored more highly.

Capture-recapture techniques were suggested by some, but a good answer would need to explain that these are relatively complex methods for doing this sort of study and need to be undertaken with great care.

Some candidates spent unnecessary time defining all the terms mentioned in the question and thus left themselves little time to actually answer the question.

Given how common angina is and how extensively coronary heart disease has been studied, surprisingly few candidates mentioned any of the validated tools available to identify cases of angina, or even suggested seeking to identify such a tool. Similarly, consulting the literature before starting was not commonly mentioned, suggesting that candidates were not actually thinking about how they really might do such as study if asked to do so, but perhaps were simply recalling learned lists of headings.

Since angina is a symptom it was surprising how many candidates mentioned using mortality data, which would capture all ischaemic heart disease deaths, not just those patients with this symptom of IHD.

Some candidates' answers related more closely to elucidation of aetiology than estimation of prevalence. This led to much irrelevant discussion of risk factors.

Question 2

In a prospective cohort study, 9,760 adults were recruited and had a standard dental examination. They were then followed for a median time of 14 years, and all deaths noted. Survival analysis was performed using Cox regression. The crude hazard ratio from coronary heart disease in subjects with none of their own teeth (n = 2,150) compared to subjects with no dental disease (n = 3,542) was 4.58. After adjustment for a range of risk factors, the hazard ratio was 1.23 (95% confidence interval 1.05 to 1.44).

a) What is meant by "95% confidence interval 1.05 to 1.44"? What are the advantages of this compared to a test of significance? (2 marks)
b) Why was survival analysis used in this study? What assumption is made by the Cox method? (2 marks)
c) What factors may have been relevant in reducing the hazard ratio following adjustment, and why might they have reduced it? (3 marks)
d) What should be concluded? (3 marks)

KEY POINTS

a) What is meant by 95%CI 1.05 to 1.44? Requires standard interpretation of confidence interval in terms of sampling imprecision: interval expresses uncertainty attaching to observed hazard ratio on account of limited sample size; it is designed to have 95% chance of including the true hazard rate that prevails in the population of which this sample is representative. Or a frequentist interpretation of: if expt repeated 100 times 95 of results would fall in this range. This first part answers what a 95%CI is. The candidate now needs to say what the interval 1.05 to 1.44 means which requires a statement about the results from this study indicating that the additional risk of death associated with absent teeth may be as small at 5% or as large as 44% in relative terms.

   What are the advantages of this compared to a test of significance?
   Advantageous to interpret directly on meaningful scale (eg 5% to 44% increase in death rate) which is in contrast to the p-value which is less directly meaningful. A significance test only gives us an indication of the probability that the observed results could have arisen by chance and gives no indication of the precision of the result and the uncertainty surrounding it – CIs give this additional information and also in fact give us the answer to the significance test since if the CI excludes 1 this implies $p<0.05$ anyway.

b) Survival data – are not distributed in a Gaussian fashion, and many survivors have censored survival times thus this requires special methods of analysis using Cox proportional hazards regression or survival analysis. It is possible to analyse mortality data using events related to person-time but this is much less satisfactory when the outcomes for many individuals are not known.

   Cox regression makes three assumptions:
   (1) The ratio of the hazards of the two groups of individuals is constant over time

(2) The explanatory variable(s) act multiplicatively on the hazard
(3) That conditional on the explanatory variables the failure times of different individuals are independent.

c) Important confounding factors include age – which could be crucial – adjusting for age likely to substantially reduce the HR.
Education/socio-economic status, and smoking – adjusting for these likely to slightly reduce the HR.
Researchers might have adjusted for BP or cholesterol – arguably this would be over-adjustment.

d) Causal interpretation problematic as adjusted HR depends crucially on what factors we choose to adjust for.
Small effect, though statistically significant on these large numbers.
Difficult to see what a directly causal relationship would mean anyway.
Residual confounding is also likely here.

COMMENTS

This question was relatively poorly answered with few candidates scoring highly.

(a) Few candidates attracted all available credit on this section. Many described what a 95% confidence interval means in general terms, which scored a mark. But the description of the advantages of a 95% confidence interval over a test of statistical significance was often scanty. Not all candidates made the two points (i) a 95% confidence interval for a ratio that excludes 1 implies statistical significance and (ii) lower and upper limits are interpretable directly, giving additional information on a meaningful scale about the likely range of results which a significance test does not give. Surprisingly few candidates used the word 'chance' when discussing these issues.

(b)The key issue in relation to the analysis of survival data is that such data are generally censored. That is, survival time is known for those individuals who die within the follow-up period, but for the others, all we know is that they were still alive at the last follow-up date. The fact that death was the primary outcome was not a sufficient explanation for why this kind of analysis needed to be performed, 'survival' analysis can be used for other time to event data where the event is not death, eg discharge from hospital. This issue was poorly understood and a considerable proportion of candidates scored zero on this section of the question.

Cox proportional hazards modelling makes three assumptions (listed above), and it was only necessary to mention one to get the full credit associated with this part of the question.

(c) Severe confounding was evidently present since the HR estimate changed by a very large amount when adjusted for a series of unspecified factors. The likely main confounding factors were mentioned by most candidates, but many went on to list risk factors for CHD without recognition that to be a confounder a factor has to be independently associated with the exposure as well as the outcome of interest.

Taking account of age is a prerequisite of meaningful mortality comparisons in general. As a strong relationship of dental status to age is also expected, the confounding role of age is expected to be crucial here. Some candidates omitted to mention age. In addition to age a series of other plausible confounders needed to be mentioned to obtain further credit together with a demonstration of understanding about confounding.

(d) Some candidates who simply repeated the results without interpreting them received little if any credit since interpretation is required to reach a conclusion.

Good answers mentioned that the adjusted result whilst still statistically significant was only small. The adjusted HR estimate is crucially dependent on what has been adjusted for. Since we are given no information about what has been adjusted for it is possible that some important confounder has not been included. Moreover, it is possible that all plausible confounders have been adjusted for, but incompletely, for example if age is grouped in decades. Both would result in residual confounding, which many candidates did not mention. Finally the biological plausibility of the finding needs to be considered. Some candidates mentioned this in the context of the Bradford Hill criteria of causality.

Overall:
It is clear that many candidates have at best a sketchy understanding of survival analysis. Since this is a complex method requiring software, clearly such calculations cannot be required in examination conditions. Nevertheless it is important for candidates to be aware of such methods, what they are used for, the assumptions they make and how the results are interpreted. The marking scheme was weighted in favour of parts (c) and (d), and it was perfectly possible to pass this question with reasonable answers to parts (a), (c) and (d).

Question 3

An individual undergoes a routine screening test for a particular cancer. She can be thought of as a typical member of a population in which the prevalence of the cancer is 1/1000.

The test has a sensitivity of 99% and a specificity of 95%.

a) What information should be given to this person to ensure fully informed consent before having the screening test? (3 marks)
b) This person is told that the result of the test is positive. She is very worried, and says that obviously it is 100% certain that she has the cancer. Advise her what, in fact, is the probability that she has the cancer. (2 marks)
c) In your view, is this particular test suitable for use in screening the population for the cancer? Justify your answer in concise notes. (5 marks)

KEY POINTS

Most or all of the following would be required for a pass:

From the data, we construct a table, for 10,000 representative people in the population group:

	disease +	disease -	total
test +	99	4995	5094
test -	1	94905	94906
total	100	99900	100000

(using the facts that 1 person in 1000 has the disease; 99 of the notional persons will test positive; and 5% of the 99900 without the disease will test positive)

a) Include:
- Details of the test and any possible side-effects
- The likelihood that a positive test will be a false positive (in the absence of specific risk factors)
- The possibility that the disease will not be detected
- The possible need for further tests and the possible delay

b) The probability that the individual has the disease is 99/5094, i.e. approximately 1 in 50 (2%).

c) Either "yes" or "no" could be justified, depending on associated circumstances:
- standard points about screening tests: existence of effective treatment for disease detected, importance of health problem, acceptability of test, overall cost benefit ;
- personal and health consequences for individuals of false positive (and false negative) test results: as shown, over 98% of those tested positive will turn out to not to have the disease, and may suffer anxiety and additional interventions while this is established;
- organization and management (and opportunity cost) of overall screening programme within the test is just one component.

The following are additional points which might improve the answer to "good" or "excellent":

- Depends on the precise population group designated to be screened (for example, age range)
- Explicit mention that (b) is the positive predictive value
- Mention or demonstration of sensitivity of predictive values to precision of sensitivity and specificity, which are often not known accurately.

COMMENTS

This question was not very well answered with much reliance on theoretical frameworks and the technical. Responses were good on specifics [e.g. calculation of sensitivity and specificity] but many candidates failed to properly address the question. While providing correct mathematical calculations of positive predictive value for example several did not answer how this and other key issues would be conveyed to the patient. Several neglected to say what actually would be the probability of cancer given the positive test. Technical language was overused and it was difficult to see how any meaningful communication would be achieved with the patient.

Question 4

You are a public health practitioner with responsibility for communicable disease control. The head teacher of a school of children aged 4-10 years in your area reports that there is an outbreak of hepatitis A amongst the staff and pupils. Outline how you would investigate and manage this outbreak in a named country.

KEY POINTS

A passing candidate will demonstrate a structured and practical approach showing how such an outbreak should be managed covering most of the key points below:

- Include a simple statement describing the presenting symptoms of Hepatitis A, what causes it, and the sequelae
- Verify the diagnosis of Hepatitis A:
    - clinical
    - microbiological
- Verify the diagnosis of an outbreak:
    - definition of an outbreak
    - background surveillance
- Mention data analysis and the possible need for a formal epidemiological study:
  a cohort study or case control study depending on the nature of the outbreak and putative exposures (though a formal epidemiological study is unlikely to be needed in practice)
- Convene an incident control team:
    - define membership
    - allocate roles and responsibilities
    - review the evidence and describe the outbreak in terms of time, place and person
    - initiate case finding
    - determine any common exposure history
    - identify specific at risk groups
    - decide and implement immediate control measures
    - disseminate information (professional/public/media)
    - monitor the implementation and outcome of the immediate control measures
    - determine criteria to declare the outbreak over
    - write a report with recommendations to prevent reoccurrence
    - awareness of where to get specialist advice and help

Passing candidates will demonstrate specific knowledge about the epidemiology and control of Hepatitis A which is appropriately related to the key points above.
A 'formulaic' answer not addressing the specifics of a Hepatitis A outbreak will not be sufficient to pass the question.

The following are additional points which might improve the answer to "good" or "excellent":

- Mention how reports are received – Notification and laboratory confirmations

- Demonstration of an awareness of the debate about the use of human normal immunoglobulin and Hepatitis A vaccine in the control of Hepatitis A outbreak
- Mention national vaccination policy
- Demonstration of an awareness of current national guidance on the control of Hepatitis A
- Demonstration of understanding of the roles of various agencies in the investigation and control of the incident (e.g. Primary Care Trust, Health Protection Agency, Environmental Health, Strategic Health Authority, micro at NHS Trust or Health Protection Agency).
- Mention of the relevance of the type of school – e.g. if it is for children with intellectual disability

COMMENTS

In general the answers to the question were well structured which is not always the case. Many candidates lost marks through not appearing to understand the practical aspects and reality of outbreak management. There was considerable emphasis on theoretical issues and less on organisational response and leadership.
There was poor knowledge about hepatitis A epidemiology and clinical features.
There was little evidence of understanding about the incubation, duration of infectiousness, or mode of transmission. There was over emphasis on food and water as potential vehicles of transmission. Many candidates did not even mention the role of vaccine in prevention and control.

Question 5

Briefly describe four different sources of information that may be used to monitor the effectiveness of tobacco control programmes in a named country. Outline the advantages and disadvantages for each source.

KEY POINTS

Key points: four of the following or any other sensible sources of data/information:

1. Data from customs and excise on the amount of taxation and duty on tobacco - these will provide information about the total volume of tobacco by population e.g. number of cigarettes smoked per capita.

Strengths: Likely to be accurate as information collected for revenue purposes.
Weaknesses: Doesn't allow any understanding of patterns of consumption by individual or socio-economic group.
May underestimate consumption due to smuggling or tax evasion.

2. Survey information on the number of current, ex and non-smokers, type and amount of tobacco smoked.

In the UK, national surveys such as the General Household Survey and the Health Survey for England provide information for adults, and there are also national surveys of young people. Other countries probably have similar national surveys. Surveys can also be carried out for smaller (subnational) areas e.g. Regional / Health Authority / Local Authority / Primary Care Organisation levels, often as part of more general "lifestyle surveys".

Strengths: Detailed information available on patterns of consumption – for example, by age group, sex, socioeconomic group, area of residence. Depending on the questions asked, it may also give other information such as desire to quit, cessation attempts, and association with other lifestyle factors.
Weaknesses: May be expensive to collect; self reported patterns of consumption may under-record or be inaccurate (information bias). Problems of "selection bias" / "non-response bias" with surveys.

3. Survey information on cotinine levels in saliva - can demonstrate validity of self reported smoking status, and on exposure to environmental tobacco smoke in children.

Strengths: Objective measurement.
Weaknesses: May be expensive and time consuming to collect. Issues of selection bias / response bias and consent.

4. Monitoring of key tobacco-related mortality and morbidity, particularly lung cancer.

Strengths: Measures real purpose of tobacco control programmes.

Weaknesses: Time delay means improvements in health status for some conditions will take many years; current patterns of disease reflect past patterns of tobacco consumption.

Many conditions such as emphysema, pneumonia may be multifactorial.

5. Routinely collected health information – e.g. if smoking status is routinely recorded in Primary Care, or in antenatal care, or other clinical care in particular groups of patients.

Strengths: If systematically collected, likely to be reasonably comprehensive for the population group it relates to.
Weaknesses: Coverage may be incomplete. Only relates to certain population groups in contact with specific health services.

Other data/information sources:

- Uptake of smoking cessation services (depends on availability of services)
- Proportion of workplaces providing smoke free environments, including public and private sector businesses; transport systems;
- Prosecutions of retailers for under-age sales;
- Degree and extent of tobacco promotion and advertising
- Surveys of public attitudes to smoking

COMMENTS

Most candidates had no difficulties with four sources of information. Some answers were very brief, perhaps suggesting that some candidates were running out of time towards the end of the exam. In addition, a few answers were rather muddled, so that it was quite difficult to work out which four sources of information had been selected to be described.

A few candidates wrote at length about tobacco control strategy, or gave long introductions about different types of tobacco control programmes, which was not really what the question was asking. Similarly, a few candidates described how they would evaluate a particular smoking cessation programme.

Many candidates did not mention the long latency period between smoking and health outcomes as a disadvantage of morbidity and mortality data in monitoring the effectiveness of tobacco control programmes. In using the term “timeliness”, it was not always clear whether candidates were interpreting this as the time period between the occurrence of the health event and the eventual availability of the data, or the period between smoking and its health outcomes.

There were a few worrying misunderstandings about the information provided by various sources, including a very small number of candidates who seemed to be suggesting that the UK decennial census gathers information about smoking habits.

Question 6

A local newspaper has stated in an article that the occurrence of stroke in your locality (population 250,000) is much higher than the national average. You have been asked to investigate this statement using readily available data and to comment on the validity of the statement based on your findings.

a) Comment on any immediate issues you would wish to understand and resolve. (3 marks)

b) Identify the various sources of data you could use to investigate this claim, briefly indicating their major strengths and limitations and (4 marks)

c) Indicate any important methodological issues that might arise. (3 marks)

KEY POINTS

Immediate issues:

* What is the newspaper's stated source of information? Is there a particular context in which the article was written? (e.g. concern about local service)
* Ambiguity of "occurrence" - prevalence, incidence, hospital admissions, mortality
* Are they referring to rates or numbers?
* The range of problems which might be encompassed by the term "stroke" e.g. whether all types are included (e.g. first stroke =/- subsequent strokes, subarachnoid haemorrhage, TIAs)
* The need to clarify "higher than the national average" e.g. possible small numbers involved. Are rates appropriately age-standardised? (Could this have been a chance finding?)
* Consider demographic and socio-economic factors in local population

Data sources:

* mortality statistics [strengths - ready availability, reasonably up-to-date; limitations - only identifies fatal cases, may be issues relating to coding of cause of death]
* hospital statistics [strengths - greater coverage of full spectrum of disease, usually readily available; limitations – incidence rather than prevalence, may count episodes or admissions rather than individuals].
* primary care data [strengths – greater coverage of full spectrum of disease; limitations – may be unavailable and/or incomplete]
* survey data [strengths - population coverage, good case-definitions; limitations – survey data may well be unavailable locally].
* stroke registers / specific information from local stroke services [where these exist]

Methodological issues

* comparisons (with national or other local data) may be difficult - e.g. case definitions, age-standardisation
* small numbers – may be wide confidence intervals around rates, may need to aggregate data over several years
* lack of data - consider if any novel local sources are available.

COMMENTS

This question was generally quite well answered, particularly parts **a** and **b**. However, some answers were very brief, particularly for part **c**, giving the impression that many candidates were simply running out of time by the end of this question.

Good answers to part **a** attempted to clarify the terms as they appeared in the question (what is meant by 'occurrence', definition of stroke, meaning of 'higher than average', … etc.), as well as considering the more "political" context in which the article appeared. However, some answers focussed almost entirely on the latter, without addressing the main epidemiological issues (either here or elsewhere in the answer).

Most candidates had no difficulty in identifying appropriate sources of data for part **b**. The question asked for *sources* of data, so it is obviously inadequate to list something like "incidence of stroke" as a source. A few candidates appear to have reproduced a set list of information sources, with perhaps little thought to the question that has been asked – for example, it is difficult to see how "police data" would be helpful in investigating the occurrence of stroke.

In indicating the strengths and limitations of data sources, some of the answers tended to be rather vague and non-specific – e.g. using terms like "robust", "accurate", "good quality data", "fairly complete", "may not be complete", "may be helpful", "coding errors" (all with no further qualification or explanation).

Some candidates had already substantially covered many of the methodological issues relevant to part **c** within their answer to part **a**, and were given due credit for this.

Paper IB

Question 7

Write short notes on professional self regulation from a sociological viewpoint.

KEY POINTS
Most or all of the following would be required for a pass:

1. **Background**. The concept of professionalisation and the historical fight by the medical profession for a professional monopoly.

2. **Who are the professions?** Within health care, medicine is the oldest and best established profession but other groupings have established their professional status while still others seek it. Generally found among highly skilled occupations, possessing a body of esoteric knowledge. State registration leads to monopoly practice.

3. **Advantages to being a profession.** The monopoly brings financial advantage and power. Professions are middle class occupation and confer status in occupational classifications.

4. **Self regulation is seen as a key component of professionalisation**.

5. **Professionalisation as a source of power within society**.

6. **Professions have power over**:
    - criteria for recruitment
    - content of training
    - terms and content of work
    - who their patients should be (the object of work)
    - tools of their profession (drugs, equipment etc)
    - means of labour (premises)
    - amount and rate of remuneration

7. **These elements make up professional autonomy**

8. **Rise in countering forces to professionalism have been identified**
    These are:
    - consumerism
    - managerialism
    - and, arguably, a more scientific perspective which leads to evidence based medicine that might be called: scientificism.

As a consequence, the medical profession control the elements of autonomy listed above.

6. Discuss failures of professional self regulation. E.g. Bristol, Shipman. Consequent policies around Clinical Governance, and increased performance management of medical profession, e.g. GMC revalidation, formal CPD processes.

Key authors include Goode and Freidson

Most students would be expected to cover points 2-7.

The following are additional points that might improve the answer to "good" or "excellent":

Points 1, 8 and 9 covered.

COMMENTS

Few candidates covered all the key points about professionalisation, self-regulation, challenges to professions and current clinical governance processes.

The poorer answers were limited in scope, framing the issues solely in reference to 'power' or to 'newspaper headline' failures (Shipman and Bristol), with no reference at all to the sociological literature or to the characteristics of professions.

Candidates were poor at providing a clear approach to the question, and in presenting a logical and structured answer.

Question 8

How can quality of life be measured in the context of cost utility analysis? Discuss the principal criticisms of the approaches used.

KEY POINTS

Most or all of the following would be needed for a pass:

- In cost-utility analysis, the benefit of an intervention is measured in the form of a composite measure which combines length of life and quality of life, the most frequent example being a QALY (quality adjusted life years).
- In order to calculate the number of QALYs gained we need data on the average length of time which the person who undergoes an intervention will spend in different states of health. We then need a value (or utility) to be placed on each of these states of health. This question focuses on the methods available to calculate these values.
- The two major issues in calculating values for states of health relate to who is asked and how they are asked.

- Concerning who is asked the alternatives include; a random sample of the population; patients with the condition concerned (rarely carers particularly for treatments affecting children) or health care professionals. Classical utility theory would favour a sample of the population at large but it is methodologically difficult to inform them about different states of health and it is at least open to question whether their views of states of health which are unfamiliar to them are meaningful. Patients and carers may have more practical experience of some of the states of health but may display views which change with time as their own health changes. Many studies have relied on the views of clinicians, but dissonance between health professionals and patients concerning the value of some health states is common.
- Concerning how they are asked there exist a complex set of alternatives. The commonest approaches are:

    - The use of rating scales in which subjects are asked to rank or attribute a value between 0 and 1 to a series of states of health
    - Standard gamble methods, briefly described
    - Time trade off analysis, briefly described

- Each method has critics, though all have been and continue to be used. Criticisms centre on the theoretical nature of the options being faced, the vast number of alternatives which may be offered under standard gamble and time trade off methods and the extent to which the questions are clearly understood.
- More recently people carrying out these studies are tending to use data collected from very large studies in which validated quality of life values have been established using standard instruments which are then also used to measure quality of life in the study itself; thus obviating the need for researchers to do their own preference measurements.

The following are additional points that might improve the answer to "good" or "excellent":

- Good descriptions of some of the methods used eg the development of the Rosser Index (a ratio scaling method which is commonly quoted but probably unique to that study)
- Standard Gamble method (in which the subject is asked to consider two alternatives one in which a treatment has a probability (p) of either becoming perfectly healthy and living for t years or dying instantly. In the second alternative they adopt a named state of health. They are asked to choose between the two, then p is varied until they are indifferent between the two).
- Time trade off method (in which the subject is asked to choose between two alternatives one of which is a number of years of perfect health followed by death, the other being a longer period of time at a health state which is less than perfect health.)
- Knowledge of one or more of the classification systems which have come into use recently eg:

    - EuroQol
    - Quality of Well Being
    - Health Utilities Index.

COMMENTS

This question was generally well answered although a significant number of candidates did not appear to have read the question properly. Many answers focused on the broader aspects of cost utility analysis or on the use of QALYs by NICE rather than the *measurement* of quality of life.

Most candidates who were familiar with these techniques, described them accurately. However, a significant minority made factually incorrect statements throughout their answers.

Question 9.

How would you lead the development and production of a strategy to promote physical activity in a local area with a population of 250,000 people?

KEY POINTS

This question emphasised the word lead and examiners expected to see not only a practical outline of how the task would be undertaken but, as this is the management section of the paper, underpinning of the answer with relevant aspects of leadership theory. There should then follow the key points of producing the strategy.

1. An introductory explanation of what a leader does in contrast to what a follower does
   - A leader provides vision, strategy, motivation, inspiration; a leader aligns people
   - Leadership is one of the key roles of a manager (Mintzberg)
   - Leadership involves influencing a group of people to attain a goal

2. Clarify the purpose and audience for the strategy with the commissioners of the strategy and also other major stakeholders

3. Identify local expertise and partners

4. Bring the group together, assign roles and motivate the group
   - Relevant management theory eg Hersey and Blanchard's situational leadership

5. Assess the evidence for the strategy
   - Review examples of good practice from elsewhere

6. Assess the local situation, an attainable future goal, timescales and milestones; the leader must ensure delivery of a finished quality strategy on time

7. Launch, disseminate and implement the strategy

8. Evaluate the strategy that is being implemented as recommended

To avoid a bad fail – two of the headings with the discussion and brief mention of a third

Borderline pass – four of the headings with discussion, plus appropriate mention and elaboration of one management theory

Good pass – five of the headings and a major part of a sixth, plus appropriate mention and elaboration of two or more relevant management theories

COMMENTS

The subject of promoting physical activity is currently highly topical and important. On the whole the question was answered well with the majority of candidates

mentioning at least two thirds of the key points. The word ‘lead’ was underlined in the question and the examiners expected some comment to be made on aspects of leadership. Unfortunately, discussion of motivation, delegation, managing conflict, incentives and other features of a leader hardly ever appeared and there was scant mention of managing group dynamics. A very small number of candidates focused solely on discussing leadership without mentioning how they would manage the assigned task. Very few candidates discussed the political context relevant to the production of the strategy. Some candidates used headings or bullet points only without writing any subtext that would convey to the examiners why the heading or bullet point was important and how it could be realised.

Question 10

Your local health service has become responsible for managing the full range of health care provision for the local prison. This was previously the responsibility of another agency. Outline the management issues involved in taking over this provision.

KEY POINTS

This answer was about the management of change in the context of prison health care. The examiners looked for a structured answer using the following major headings. Mention of relevant management theory and models of change was taken into consideration as indicated.

1. Understanding why and who wants this change and who does not
    - SWOT analysis
        - Strengths and weaknesses – 7S model
        - Threats and opportunities – PESTELLI

2. The context of the change and appreciation of interdependent factors for the agency becoming responsible
    - Health care in the context of a security setting
        - Situation analysis
            - Barriers, levers and facilitators for change
            - The local situation – environmental factors affecting change
        - Culture change

3. Consulting with staff involved, their representatives and other stakeholders
    - Force field analysis and the need to reduce the resisting forces
    - Line management changes, accountability, terms of service
    - Communication and feedback from staff

4. The process and implementation of change using where possible an evidence base for change
    - Plan-do-study-act, action research
    - Project management and process mapping
        - Goal setting, planned work programme, milestones
        - Relevant expertise – representatives with the authority to make decisions from prison, healthcare, human resources, finance, local health service

5. Performance monitoring the results of change

For avoiding a bad fail – two headings with discussion

Borderline pass – three headings with discussion and appropriate mention and elaboration of one management theory

Good pass – three of the headings and a major part of a fourth with discussion and appropriate mention and elaboration of two or more management theories

COMMENTS

This question was answered poorly. However, there was a wide range of answers from the thoughtful answer informed by management theory to the answer lacking structure and knowledge. Change management is a key function of the public health practitioner and the examiners expected thorough answers written in a systematic way.

A moderately common falling was the description of different change management models or 'off the shelf' frameworks without contextualising them to the setting of prison health in any way whatsoever. While some candidates structured their answer purely using different management theory and no reference to the task in hand others strung statements together in no coherent form. A number of candidates devoted the majority of their answer to discussing current health services provided by a prison without taking the change process forward. Although there were some clear exceptions the answers to this question were disappointing.

Paper IIA

Your health board, which is responsible for commissioning local services and which contains a majority of lay members, is keen to offer acupuncture as a service in the NHS locally. In support of this suggestion the following recent publication from the British Medical Journal (*BMJ*) has been put forward.

Acupuncture for chronic headache in primary care: large, pragmatic, randomised trial. BMJ 2004;328;744-. Andrew J Vickers, Rebecca W Rees, Catherine E Zollman, Rob McCarney, Claire M Smith, Nadia Ellis, Peter Fisher and Robbert Van Haselen

1 Write a structured abstract for this paper using no more than 250 words. (5 marks)

2 Write a critical appraisal of this paper. (20 marks)

3 You have found another paper on this subject published in the Journal of the American Medical Association (*JAMA*). Read the provided abstract for this *JAMA* paper. Write a report for your health board explaining the difference in results of the *BMJ* and *JAMA* papers. In your report you should explain the concept of 'causality' as applied to these two papers, the placebo effect and the ethics of the use of placebos as treatments in clinical practice (as opposed to their use in randomised controlled trials). (20 marks)

4 Describe how you would ensure quality if you did commission an acupuncture service. (5 marks)

KEY POINTS

1 As per published abstract

2 Commissioned by the UK NHS National Coordinating Centre for Health Technology Assessment and the protocol presumably agreed by the NCCHTA, so provenance is good.
Randomised trial with usual (best) treatment control so OK on face of it.
Patients self selecting on the basis of willingness to have acupuncture: whilst no bias as randomised subsequently does have an impact given study design ... see later.
Exclusion criteria specified. Flow chart (fig 1) incomprehensible ... figures don't add up/ make sense.

Intervention delivered by registered physiotherapists with postgraduate training in acupuncture and traditional Chinese medicine but 'the acupuncture point prescriptions used were individualised to each patient and were at the discretion of the acupuncturist' ie not standard acupuncture points that could be reproduced in another trial.

Outcome measures based on headache severity scales: no indication as to whether this has been validated and in particular how sensitive it is in measuring change (the use of the term 'Likert' scale is perhaps spurious). What constituted clinically relevant

change was specified in protocol (35% reduction) but no indication of how it was decided (cf with headache specified by International Headache Society)
Definition of 'clinically relevant' reduction in headache frequency (50% reduction in days with headache cf 35% above) adopted from International Headache Society.
Measured at 3-monthly intervals.
Very well validated SF-36 general health status tool used.

Results

Participants predominantly women but equally so in both arms: two arms generally the same.

At 3 months (immediately post acupuncture) measures of headaches superior for acupuncture vs no acupuncture but not for medication measures. At 12 months 6 of 7 of these measures were superior. However they do not present their data for 6 and 9 months ... half of the outcomes data they collected. The trend of differences would have been interesting given the findings of enhanced outcomes 9 months after acupuncture ceased (not many patients had treatment continuing after 3 months of treatment).

SF36 results show benefit in 2 domains but only at 12 months, though 'health change' is significantly better at 3 and 12 months (health change is the only single question 'domain' in the SF36, the others being composites of 2 to 10 questions). Given that there are (excluding 'health change') 16 results (8 + 8 at 3 and 12 months) the two positive results might be of questionable significance; again results at 6 and 9 months would have been of interest.

There was no significant difference in resource usage, a post-hoc measure.

Fig 2 showing the relationship between headache frequency at baseline vs reduction in headaches appears to demonstrate very high variance but no statistical analysis is provided, eg regression coefficient or the lines for 90/95% confidence limits of the regression curves. The authors did however attempt to adjust for regression to the mean (explanation of this phenomenon would gain some marks).

Candidates are expected to comment on the Discussion section and the Conclusions especially 'What this study adds'.
Placebo effect, sham acupuncture as true control, ability to use results of Vincent's study instead of proper controls here. Is this paper sufficient to expand NHS acupuncture (NO, very definitely NO!)?

3 Some of this should have been mentioned in answer to question 2 but candidates need to be able to explain to a lay audience concepts in the 'diagnosis of causality' such as:

Bias (confounding) these two contributing to an assessment of specificity ... not specific as its due to:
Chance
Strength of relationship (size of RR)
Dose response (number of sessions of acupuncture?)
Internal consistency of results (eg across similar domains of SF36 or headaches/medication)

Reproducibility (problem with choice of acupuncture points)
Comparison with results of other studies ... larger or better design
Is it biologically plausible ... if not needs stronger evidence ... better designed, larger trials with higher RRs and reproduced by other researchers (then reassess known biology if still positive!).

Placebo effect... result of perception of being cared about/for. Some actions more potent than others ... laying on of hands, needles (!), red pills (as opposed to other colours) compare with 'Hawthorne effect'. Typically 30% effect (cf this study!).
What are the additional effects of choice for the patient ie being able to choose a treatment one 'believes in'?
Considered unethical to use placebo pills to treat patients, yet the implication of the discussion of the 'pragmatic' trial is that acupuncture should be provided even if it is a placebo.

4 Should have clearly described treatment (patient) pathways for migraine/chronic headaches with eligibility criteria for acupuncture. Need clinical governance mechanisms including audit. Will need to decide how to accredit practitioners as there is no professional body with the statutory duty to do so for acupuncture, at least, not in the UK.

COMMENTS

This question was answered very poorly by a majority of candidates. Some candidates wrote abstracts over 250 words: these failed that section, the longer the abstract the worse the mark.

A majority of candidates did not critique the paper but rather described (often using exactly the words used in the paper) what was done and/or listed points from a guidance to critically appraising a trial but did not specifically apply them to this paper.
Some candidates almost re-wrote the whole paper without applying any level of intellect or knowledge at all.

Good candidates need to explain clearly why an RCT provides the highest level of evidence for causality and to discuss the merits of controlled vs placebo controlled vs blinded placebo controlled vs double blinded placebo controlled. When discussing specific sources of bias e.g. concealment of allocation, they need to demonstrate that they understand what the term means and discuss what kind of bias might occur if this is lacking. Similarly simply writing 'Statistical tests were appropriate' or 'results were presented in an appropriate way' cannot score points because these statements do not demonstrate any level of understanding.

A majority of candidates demonstrated that they did not know what selection bias was. Most suggested that the process of selecting participants for the trial would induce selection bias – however selection bias occurs when there is a systematic difference in the likelihood of selecting subjects to take part in a study on the basis of their association between exposure and outcome status. In an RCT if allocation is concealed then there should not be selection bias. By contrast if it were not concealed and the person allocating to groups was systematically allocating the most

ill patients to the new intervention (or control group) then selection bias would occur. How the participants are originally selected to be invited into the trial will affect generalisability, for example - the recruitment of participants who are interested in the study may mean that the results are only generalisable to those interested in acupuncture, but it will not lead to selection bias if the randomisation allocation is done appropriately - i.e. with adequate concealment. Typically in a trial of an intervention there will be entry/treatment criteria that subsequently dictate/constrain clinical practice e.g. here any results are only applicable to the use of acupuncture for headaches and cannot be used to provide evidence for or against the use of acupuncture for other conditions.

A majority of candidates demonstrated that they did not understand the concept of confounding and that well-conducted RCTs are unlikely to be importantly affected by confounding. Since confounding and how it is dealt with in RCTs is basic to public health science this demonstration of a lack of sound knowledge was very disappointing. What candidates had learned about epidemiology in case control or cohort studies they seemed unable to apply to the experimental conditions of a clinical trial in which many of the problems of epidemiology are addressed through the trial design.
Candidates were not good at recognising that the observers in this case were the patients and as they were not blinded they were inevitably biased not least because they were probably (self-) selected with a prejudice towards acupuncture. A highly subjective outcome measure was used, headache severity, which would have amplified this effect. Parametric tests were used but no one questioned whether the data were indeed continuous (Likert scales are ordinal) or normally distributed.

For part 3 a majority of candidates simply listed Bradford-Hill criteria and listed the 4 guiding principles of medical ethics but didn't relate these to the question in hand. Candidates need to demonstrate knowledge and understanding (not simply the ability to remember lists) to pass this paper and perform well as public health practitioners. The JAMA study used the accepted and objective binary measure of headache frequency as its main outcome and for this produced a benefit greater than the BMJ study with the no treatment arm identical to the BMJ. It thus both confirmed the BMJ result *and* challenged its conclusions, by further demonstrating that 'real' acupuncture performed no better than 'sham' acupuncture. Note that Vickers and Linde collaborated on the Cochrane review!

A large number of candidates actually provided justification for the use of placebos in clinical practice. There is absolutely no justification. It is unethical. It is very worrying that candidates for part A could believe that it is OK to give a placebo in the NHS or any health service (some candidates actually stated that it would be better to roll out the 'sham' acupuncture because it was likely to be cheaper than the real thing). A placebo in clinical practice is a deceit for which there is no informed consent. If it's OK to give a patient a placebo, even if the patient believes in it, then that justifies the prescribing and selling of any quack medicine if you can convince a patient that it works. In a clinical trial, patients know they may be deceived and consent to it.

Part 4 was mostly well answered, but there was still a tendency to produce lists with little discussion.

Paper IIB

During 2004, the Republic of Ireland became the first country to prohibit smoking in all workplaces, including bars and restaurants. You are a public health advisor to an island community that is considering similar legislation, and has a population of ½ million and a major tourist trade.

Cotinine, a metabolite of nicotine, is a highly sensitive and specific biochemical marker of exposure to tobacco smoke over the past few days. Active smokers generally have cotinine levels in saliva or blood of 15 ng/ml or greater, but concentrations lower than this can result from passive smoking. The figure presents geometric mean salivary cotinine concentrations as measured among self-reported non-smokers in the Health Surveys for England, 1996-2003.

1. Describe the data presented in the figure. [10 marks]

2. Comment on possible explanations for the variations by age, by gender, and between smoking and non-smoking households. [10 marks]

3. Suggest how the patterns shown in the figure would be likely to change as a result of a workplace ban on tobacco smoking. [5 marks]

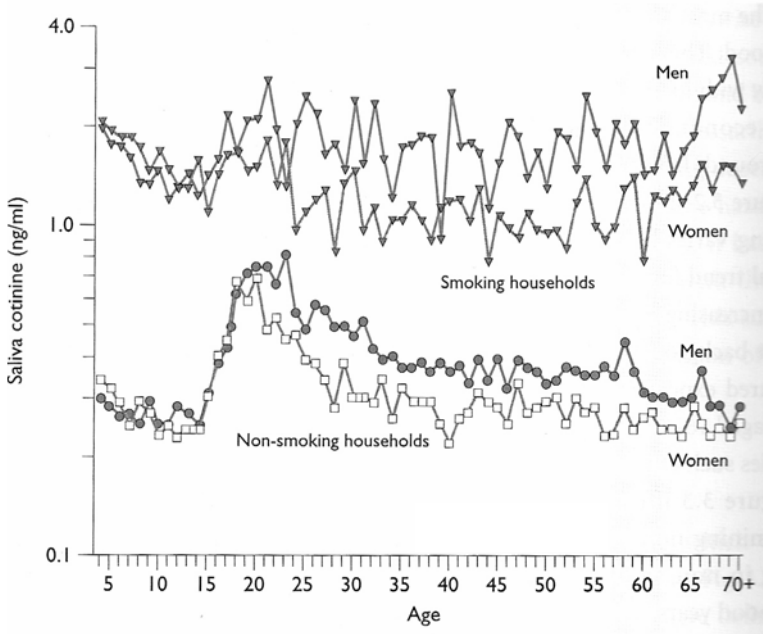
A recent paper in the British Medical Journal (Jamrozik K, *BMJ* 2005;**330**:812) estimated that passive exposure to tobacco smoke in the workplace (in the absence of smoke-free legislation) is responsible for 2% of all deaths among persons of working age in the United Kingdom, with almost one-tenth of these attributable deaths occurring among workers in the hospitality industry (pubs, bars, nightclubs, restaurants and hotels).

4. Outline the principal types of information that would need to be assembled to derive this estimate. [5 marks]

5. Suggest a suitable source for each type of information to derive a similar estimate for your island community. [5 marks]

6. Write a briefing paper of no more than 500 words for your Chief Medical Officer, outlining the public health arguments for reducing environmental tobacco smoke exposure throughout the community, and presenting the case for your island's parliament following the Irish example of legislating for smoke-free workplaces. [15 marks]

Figure


4.0
1.0
0.1
Saliva cotinine (ng/ml)
Men
Women
Smoking households
Men
Non-smoking households
Women
5
10
15
20
25
30
35
40
45
50
55
60
65
70+
Age

KEY POINTS

Q1

a) Describe axes and comment on log scale for cotinine.
b) Explain what a geometric mean is, and express contrasts in terms of ratios.
c) Participants from smoking households have higher cotinine levels, but no 95% CI shown.
d) Differences between smoking and non-smoking households similar for the two sexes.
e) Marked rise in continine levels from age 15 onwards in non-smoking households, seen only to a small extent in smoking households.
f) Throughout adult life, in both smoking and non-smoking households, males have higher continine levels than females.

Q2

a) Children v adults in non-smoking households: effect of ETS exposure in public places (pubs etc.) from age 15 onwards, most prevalent in the 18-30 age group.
b) Males v females in both smoking and non-smoking households: more "pub culture" and/or workplace exposure in men. (Biological differences in nicotine metabolism unlikely because gender differences are not seen in children).
c) Declining cotinine levels from age 5 through 15 in children – less close contact with parents and carers, more time spent outside the home as children grow up.
d) Possible inaccuracies in self-reported non-smoking status would result in some active smokers appearing in the data (likely to be more in smoking households).
e) Classification of "non-smoking households" ignores regular visitors and carers outside the home.

Q3

a) "Workplace ban" would reduce not only exposure at place of work, but also "public place" exposure in bars, pubs, clubs etc.
b) Likely to reduce the size of the peak in cotinine levels after age 15 in non-smoking households
c) Likely to reduce the male-female differential throughout adult life in both smoking and non-smoking households, particularly the latter.
d) Effects of workplace ban on active smokers is less predictable. May smoke more in the home, leading to higher levels of passive exposure for their non-smoking housemates, or may be persuaded to stop altogether, resulting in some smoking households transferring to the non-smoking category. (Either suggestion would gain credit.)

Q4

a) Explain that this is an estimate of population attributable risk fraction/percent (or aetiological fraction) which combines information on prevalence of exposure, and relative or excess risk associated with exposure. Credit should be given for an appropriate formula.

b) In this case, we need two measures of "exposure prevalence": the proportion of the whole population working in smoky workplaces, and the proportion working in the hospitality industry.
c) For each type of exposure, an estimate of the mortality risk, compared to persons without workplace exposure would be needed.

Q5

a) Exposure prevalence will need to be established locally, as it is almost certainly different from UK. Mortality risks will not be easily or precisely estimated locally, so need to be derived from the literature.
b) Recent census data may be suitable for estimating the proportion of population working in the hospitality industry. Surveys, either of employers/workplaces, or of general population samples, will be required to estimate the proportion exposed to non-smokefree workplaces.
c) Most expedient would be to apply the estimates of mortality risk in Jamrozik's paper directly to the exposure distribution in the island community, but alternatively…
d) …search the literature for published meta-analyses (typically these will be cause-specific mortality, not total mortality), before embarking on a bespoke systematic review.
e) Mortality risks for passive smoke exposure have to be assumed to be similar to those in other countries, if the international literature is to be used.
f) Also, it has generally been necessary to extrapolate from studies of domestic ETS exposure to estimate the risks associated with workplace and public-place exposures.

Q6

a) Summarise the diseases (fatal and non-fatal) that are associated with passive smoking – lung cancer, CHD, stroke, respiratory diseases in both adults and children, glue ear, cot death – plus the "nuisance" of mucous membrane irritation.
b) Point out that ETS exposure is much more widespread than workplace exposure – domestic exposure is the principal source (use HSE figure for evidence). However…
c) …influencing parental behaviour requires education, not legislation.
d) Opportunities to legislate arises for non-domestic exposure, and a workplace ban would have beneficial spin-offs in reducing public exposure in bars, pubs, clubs etc.
e) Comment on the success of the Irish example, leading to widespread public acceptance of smoke-free pubs without major impacts on trade in the hospitality industry.
f) Identify possible barriers to implementation – opposition from the tourist industry, tobacco and alcohol lobbies, public pressure groups.
g) Suggest how the implementation and consequences of the ban might be evaluated – survey workplaces and tourist destinations, interview surveys, before-and-after studies of cotinine levels.
h) Present the arguments in a coherent and logical form, within the word limit.

COMMENTS

Q1-Q3. Most candidates answered these parts of the question adequately. It was disappointing that few offered a definition of geometric mean, or commented on the use of a logarithmic scale. The weaker answers were from candidates who overlooked the fact that the data were from self-reported non-smokers, and tried to explain differences between smoking and non-smoking households, and by age, on the basis of active smoking by the respondents. However, due credit was given for mentioning the possibility of some errors in the self-reported smoking status.

Q4-Q5. Performance on these parts of the question was generally very disappointing: some candidates picked up no marks in these sections, although one or two gained full marks. Only a minority of answers mentioned the concept of population attributable risk, and where formulae were offered they were often incorrect. Very few candidates demonstrated an understanding of the data requirements for such a calculation and showed convincing evidence that they would be able to derive an estimate for their local population, based on published literature and local exposure prevalence figures.

Q6. There was a very wide range of marks gained for this part of the question. A substantial minority submitted reports less than half of the required length, missing an opportunity to gain marks. The weakest answers simply regurgitated the material presented in the question or offered no scientific evidence whatsoever of the risks of passive smoking. Many emphasised the known risks of active smoking, but did not clearly present the evidence relating to passive exposure. The better answers were those that combined a summary of the epidemiological evidence with a balanced assessment of the political, ethical and commercial implications of a smoking ban, drawing on the experience of successful implementation in Ireland and elsewhere. Given the prominence of this public health issue in the 12 months leading up to the examination, it was disappointing how little original material was incorporated into the answers. Few answers were written in a style suitable for consideration by a Chief Medical Officer.