



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

JANUARY 2010

**EXAMINATION QUESTIONS WITH KEY POINTS AND
EXAMINERS' COMMENTS**

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

Paper IA

Question 1

In a recent study of cot death (sudden infant death syndrome), it was reported that the adjusted odds ratio for cot death associated with using a dummy (pacifier) during the last sleep was 0.08 (95% confidence interval 0.03 to 0.21).

- a) Explain what the adjusted odds ratio of 0.08 means. What does this tell you about the relationship between use of a dummy and cot death? (40% of marks)

	Did not use dummy			Used dummy		
	Case	Control	Adjusted odds ratio [†] (95%CI)	Case	Control	Adjusted odds ratio [†] (95%CI)
Co-sleeping with mother who smoked	26	6	4.5 (1.3-15.1)	1	6	1.10 (0.1-13.4)
Sleeping alone or co-sleeping with non-smoking mother	133	228	1*	6	67	1*

† Adjusted for maternal age, race, education, infant age, infant year of birth and region

* Baseline comparison group

(Modified from De Jun Li et al, BMJ 2006; 332:18-22)

- b) What do the data in the table about dummy use, co-sleeping and mother’s smoking suggest? (30% of marks)
- c) Given these findings, comment on whether use of a dummy should be promoted as an intervention to reduce cot death. (30% of marks)

KEY POINTS

- a) Odds ratio is the odds of using a dummy if a case, relative to odds of using a dummy if a control (or vice versa).

“Adjusted” implies that the results have been statistically adjusted for possible confounders. In this case, potential confounders that the authors may have adjusted for include sleeping position, sex, birth weight, gestational age, ethnicity, number of blankets, maternal age, maternal smoking etc.

In this case, the odds ratio is statistically significant, as the 95% confidence interval (0.03 to 0.21) excludes the value of 1.0.

These results suggest that the odds of cot death are considerably reduced in children who use a dummy compared to those who do not use a dummy.

(40% of marks)

- b) Co-sleeping with a mother who smokes is known to increase cot death risk.

In infants who do not use a dummy, the odds of cot death are increased over four times by co-sleeping with a mother who smokes compared to either not co-sleeping or co-sleeping with a mother who does not smoke. This increased odds ratio is not observed in infants who use a dummy.

This implies that the odds of cot death in a child who co-sleeps with a mother who smokes is modified by use of a dummy, such that dummy use appears to protect a child from their otherwise increased odds of cot death. (i.e. candidates must include some statement that dummy use is an effect modifier, or an interaction occurs).

Additional credit will be given for noting that the difference in odds ratios observed should be formally tested by an interaction test to check that this apparent effect modification is statistically significant.

(30% of marks)

- c) Cot death is a major cause of child mortality under 1 year in UK and other developed countries, but this cause of death appears to be reducing each year.

Dummy use appears from this study to reduce cot death risk markedly. However, the association between dummy use and cot death does not necessarily imply a causal relationship. The mechanism by which dummy use may reduce cot death is not known.

Dummy use may interfere with breast feeding which is promoted as the best form of nutrition for a child under six months of age.

Whilst, these observational data are suggestive of a simple strategy to further reduce cot death, further evidence would be required before a change in advice was to be made given that such advice may interfere with efforts to promote breast feeding.

(30% of marks)

EXAMINER COMMENTS

Most candidates answered the first part of this question adequately. Most could also adequately describe the data in the table but many failed to adequately interpret these data and only a few candidates commented that the data demonstrated an effect modification/interaction. When asked to comment on whether the use of a dummy should be promoted, few candidates considered the implications of promoting dummy use on infant health overall. Weaker candidates were imprecise in their language when discussing key concepts, could not adequately interpret the odds ratios, contradicted themselves as to the interpretation of the odds ratio in different sections and supported the use of dummies on the basis of this single study.

Question 2

In the context of qualitative research, describe three important features of each of the following:

- a) Semi-structured interview techniques (33% of marks)
- b) Participant observation (33% of marks)
- c) Focus groups (33% of marks)

KEY POINTS

a) Semi-structured interview techniques (any three of the following points, or any other correct and appropriate statements, would gain credit):

- The purpose of most qualitative interviews is to gain an insight into the experiences and perspectives/ meanings of the people being interviewed thus semi-structured interviews are designed to enable people to talk more freely about their experiences and feelings than they could if offered direct, 'tick-box', questions
- The interviews are conducted in the form of a guided conversation being conversational in tone and pace and shaped by the participants' rather than the interviewers' perspective.
- The listening and prompting skills of the interviewer are very important. A good qualitative interviewer will be an excellent listener, sensitive and able to adapt to the issues raised by the respondent.
- A loose interview schedule or prompt-guide is commonly used to ensure the researcher has asked all the specific questions they are interested in seeking an answer to, but also to provide ice-breaking questions if the interviewee is reticent. The prompt-guide is, however, used as a guide and not a uniform schedule that requires questions to be asked in a strict order with pre-set response categories.
- Interviews are commonly audio-taped (and sometimes video-taped) and recorded verbatim to avoid the need to take notes which would interrupt the flow of conversation and lead to the loss of information.
- If new areas of interest emerge during the data collection phase questions about that theme might be incorporated into later interviews. The prompt-guide thus evolves to incorporate these new themes.

b) Participant observation (any three of the following points, or any other correct and appropriate statements, would gain credit):

- Participant observation entails the **extended** involvement of the researcher in the social life of those he or she studies.
- Many definitions of participant observation and ethnography are difficult to distinguish, because both emphasize the researcher immersing him- or herself in a social setting for an extended period of time. Both ethnographies and participant observations often use methods of data collection other than observation (such as informant interviews on issues that are not amenable to observation and the collection of documents) to collect data. Ethnographies, on the other hand, tend to have a specific focus on the culture of the group in which the ethnographer is immersed and also frequently simultaneously refer to both a research method and to the written product of that research.
- During a participant observation a researcher will:
 - Make regular observations of the behaviour of members of that setting;
 - Listen to and engage in conversations;
 - Interview informants on issues that are not directly amenable to observation or that the researcher is not clear about;
 - Develop an understanding of the culture of the group and people's behaviour within the context of that culture;
 - Write up a detailed account of the setting;

- Researchers can adopt different roles in the field while conducting a participant observation in relation to the social setting and its members. One of the most widely cited schemes is Gold's classification of participant observer roles, which can be thought of as a continuum ranging from more involvement to less involvement with the members of the social setting. The four roles are: complete participant (more involvement), participant-as-observer, observer-as-participant and complete observer (less involvement).

c) Focus groups (any three of the following points, or any other correct and appropriate statements, would gain credit):

- Focus groups have been found to be particularly helpful in exploring patient/user/staff experiences, attitudes and knowledge, understanding cultural norms/contexts and public dissemination of research findings.
- A key component of focus groups is the interaction between individuals in the group. Amongst others, this interaction highlights social processes, enables respondents to formulate their perspectives from sharing of common experiences, may facilitate the involvement of those who otherwise feel they have nothing to contribute. Analysis of the focus groups needs to take this interaction into consideration.
- It is usual to undertake several focus groups consisting of between 4 and 10 participants. The constitution of the individual focus group is dependent on the objectives of the research.
- A moderator is necessary to prompt discussion and an observer to note interactions between participants. The observer also provides some external scrutiny of the process. The venue and ambience of the sessions are important.
- The advantages of focus groups include that a broad series of topics may be discussed, consensus views may be obtained, and they are perceived as less costly and easier to undertake than individual interviews. They are particularly useful for investigating sensitive topics and for generating critical comments, as well as, in highlighting differences between groups
- The disadvantages of focus groups include that they cannot investigate problems in depth, participant's answers may not be independent and weaker members of the group may acquiesce to more dominant members, a narrower range of responses may be identified and they might be considered less confidential.

EXAMINER COMMENTS

Most candidates were able to identify some key features of the qualitative research designs that they were asked about. However, although the question asked for 3 important features of each, many candidates wrote all they knew about the design and the discussion of key features was often superficial. Occasionally, candidates were confused about terms and discussed semi-structured questionnaires and non-participant observation. Some appeared confused about key features of the research designs for example the composition of the focus group and its homogeneity or lack thereof, which methods were more costly / less costly and which were more appropriate/less appropriate for sensitive issues. Some key features were infrequently discussed e.g. interaction in focus groups, the need for more than one focus group and, sometimes, features common to several designs were given as key features of a particular design. Some candidates spent time discussing the advantages of qualitative research overall, which was not part of this question and therefore did not gain credit.

Question 3

A former industrial site is to be developed as a residential area. There are concerns that the soil is highly contaminated with heavy metals.

- a) Outline the public health considerations. (30% of marks)
- b) You are a Public Health Practitioner working in the Public Health/Primary Care organisation which covers the area where the site is located. What actions would you recommend? (70% of marks)

KEY POINTS

Most of the following would be required for a pass:

Public Health considerations:

Contaminated land may give rise to:

- human toxicity problems depending on degree of exposure and the nature of the contamination.
- accidents as the low pH of the soil may cause structural damage to the building and affect service pipes of all sorts (gas, electricity, water and sewage).
- Exposure would be minimal inside the dwellings. Exposure greater in gardens if there is contact with soil (especially children with pica), contact with plants and the consumption of any vegetables grown.
- If there is serious contamination plants may not grow.
- Public protest and also apparent clusters of congenital anomalies in surrounding areas.

Actions:

- Validate the concern by seeking a history of the site, determine past land use, collect maps and plans of the area and based on the history seek appropriate chemical analysis of soil and environment (including control soil samples to determine "background" levels). Different industries are associated with different contamination hazards. Collaboration with local government environmental health officers and the government body responsible for the environment (e.g. Environment Agency in England & Wales/ and any other environment agency is essential. Consider carrying out site visit.
- Industries of particular concern: Glassworks, printing, coal gas production, lead works, paint manufacturers and chemical manufacturers. Seek additional advice from experts.
- Undertake full assessment of public health impact and if concern is validated, seek to prevent residential use. This would be working in conjunction with the board or decision making mechanism of your organisation and housing planner organisations. (e.g. the board may formally respond to any consultation document the planners have). Ensure involvement of all stakeholders in decision making.
- a plan for dealing with the ensuing publicity and complaints including media etc.

If residential use goes ahead:

- consider replacement of garden soil to the depth guided by sampling.
- discourage consumption of any root vegetables grown.
- advise local health professionals (doctors, health visitors, etc) to be alert for signs and symptoms of toxicity.
- Consider long term follow up and monitoring

The following are additional points which might improve answers to “good” or “excellent”:

- The land may, over time, have had more than one contaminating industry.
- Bigger potential problem than a specific industry is the use of the site as a rubbish tip for several industries.
- There is a potential hazard to the builders who may work on the site.
- Building may disturb existing pattern of water drainage from the site, so polluted water may now contaminate another area.
- The validation exercise may use old maps and trade directories.
- High sulphate levels often associated with heavy metals.
- High sulphate levels are associated with a process that attacks cement.
- Chemicals may breach domestic water supply pipes to contaminate drinking water.

EXAMINER COMMENTS

Overall this question was generally well answered. Candidates who scored well gave a well structured answer, with details of the main key points and where they used broad concepts they applied them specifically to the question and their answer. Candidates who scored poorly included those with a poor structure to their answer (including repetition and vague answers for one or both parts of the question); a lack of specific mention of health effects of heavy metals and contamination of soil and water; lack of mention, or only vague mention, of health impact assessment; failure to mention involving the residents in the communication aspect of action; and failure to mention long term monitoring or an indication how contamination might be mitigated.

Candidates who used broad concepts without applying them specifically to the question, attracted limited credit.

Question 4

Write short notes on the epidemiology and control of the following diseases in the United Kingdom or another named country:

- a) Clostridium difficile infection (50% of marks)
- b) Legionnaires' disease (50% of marks)

KEY POINTS

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

Candidates are expected to show knowledge of the following (see table below for detail):

- Common clinical features
- Incidence(approximate) and trends, including at risk groups/factors
- Causative organism
- Laboratory identification
- Reservoirs of human importance
- Transmission
- Surveillance
- Methods of control including prevention, public health response to sporadic cases and outbreak control.

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

- well structured answer
- mention of relevant national policy
- mention of other agencies involvement in prevention and control
- Knowledge of the added value of enhanced surveillance systems
- Knowledge of relevant research findings.

	Clostridium Difficile	Legionnaires disease
Common clinical features	Important cause of hospital iatrogenic diarrhoea (pseudomembranous colitis post antibiotics in elderly, fever, loss of appetite, abdominal tenderness.) Symptoms start few days after antibiotics	Pneumonia or milder febrile illness (Pontiac Fever) Incubation 2-10 days Pneumonia resistant to usual antibiotics may indicate diagnosis
Incidence/trends	Increasing – could be due to increased investigation and reporting.	Unknown. Sporadic or clusters Approx 300 cases (i.e. relatively low nos compared with some infections but important) in UK per year. Mortality 10-15%.
Risk groups	Patient requiring intensive care/ invasive procedures, cytotoxic treatment ,antibiotic exposure, advanced age	70% male and 95% over 30y Chronic illness e.g. lung disease and diabetes, smokers. Nearly half travel abroad Some outbreaks linked e.g. water cooling systems
Causative organism	C Diff	L pneumophila, many serogroups
Lab identification	Toxin, culture, sensitivities, typing	Urine antigen, serology

Reservoirs of human importance	CD may be present in healthy adult faeces	Environmental water Man-made water systems.
Transmission	Person to person or via hands of healthcare workers or spores in environment/via fomites (e.g. commodes)	Inhale legionella bacteria in droplets and aerosols
Surveillance (UK)	Routine testing of patients with diarrhoea. (In UK mandatory testing and reporting required)	Not notifiable in UK. Usually reported to local Public Health. E.g. HPA detailed surveillance scheme.
Surveillance (HK)	Not a notifiable disease in Hong Kong.	Notifiable disease in Hong Kong with less than 20 cases being reported per year over the past ten years.
Methods of control/prevention/ PH response to sporadic cases and Outbreaks	Control of antibiotic use, infection control procedures (disposable gloves and apron, hand washing— for both staff and visitors) early diagnosis and, isolation of patient, environmental cleanliness, identification of clusters and additional specific measures for staff, patients and visitors.	Investigation of individual and clusters with risk factors for previous 14 days Sampling etc. of potential environmental reservoirs. Good hygiene practises during maintenance of man-made water systems. Improvement notices, prosecution etc

EXAMINER COMMENTS

This question was quite well answered. Very good answers were well structured and clear, and dealt with the majority of the points in the table. Some candidates wrote about the wrong clostridial infection, and answers often lacked sufficient detail about both epidemiology (particularly C Diff) and control measures (particularly legionnaires disease). Many candidates were confused about whether infections were notifiable or not.

Question 5

Answer all the following questions:

- a) Explain how a population pyramid is constructed and its purpose. (30% of marks)
- b) What influences determine the shapes of population pyramids? (30% of marks)
- c) Describe the typical differences between the present-day population pyramid of an advanced industrial nation and that of the same country 100 years ago, and list any health policy implications of this. (40% of marks)

KEY POINTS

- a)
 - population pyramids are back-to-back histograms that illustrate the age and sex structure of a population (a diagram of a population pyramid would aid explanation)
 - the information required to construct a population pyramid is obtained from population estimates, a population Census, or population projections
 - the number (or percentage) of people is shown horizontally (x-axis) and the age groups are shown vertically (y-axis), males and females are shown separately on opposite sides of the y-axis
 - a population pyramid gives a static representation at a point in time of the size and structure of a dynamically changing population. It can illustrate past or future effects of cohort and period influences on populations. These dynamics can be understood from examining a sequence of pyramids
- b)
 - the number of people in any particular age group is a function of historic numbers of births, their lifetime net migration, and their cumulative mortality experience
 - fertility has the most influence on population age structure (although migration can have important effects in small populations). High fertility populations have a more pyramidal shape, with each successive age cohort being larger than its predecessor
 - the number of births depends upon the size of the fertile female population and the fertility rates prevailing at given ages. Population pyramids can show “echo” effects when members of large cohorts themselves have children
 - in conditions of low fertility, improvements in mortality have the greatest impact as people survive longer. These pyramids become more rectangular in shape with a gradual tapering at older ages
- c)
 - the answer should describe the changes in the overall size of the population and in its age structure. Candidates should outline the main changes in fertility, mortality and migration which determine the shape and size of the population pyramid. Explanations, social and otherwise, for these changes should be given
 - the change from a state of high fertility and mortality and young age structure to a state of low fertility and mortality and older age structure will be linked to:
 - a. falls in death rates from infectious and diarrhoeal diseases, respiratory diseases and maternal mortality
 - b. chronic degenerative diseases, notably circulatory diseases and cancers, becoming more important as causes of death
 - alternative causal models include economic change, environmental improvements, female status and literacy, and the move towards nuclear families
 - the changing dependency ratio in a population with fewer young people and more older people (and increasingly, more very old people) has implications for both supply and demand elements of health policy
 - a. Supply

- i. tax revenue to support health services may be limited if smaller proportion of population employed
 - ii. health services may struggle to recruit staff
- b. Demand
 - i. more diseases associated with ageing (heart disease, diabetes, hypertension, osteoarthritis, dementia etc)
 - ii. possibly less need for paediatric, obstetric services

Hong Kong perspective: HK population pyramid influenced by 2nd World War and subsequent demographic changes; rapidly progresses to one typically seen in an industrialised ageing population, although partially compensated by immigration from mainland China. Population pyramid in mainland China may take the shape of an inverted pyramid resulting from the one-child policy.

EXAMINER COMMENTS

Overall this was a well answered question with the vast majority of candidates passing. However, many candidates did not appreciate the strong influence of fertility rate on the shape of the population pyramid. They simply listed two factors: birth rate and death rate (including infant mortality rate), while a smaller proportion also mentioned migration. Some candidates failed to mention the different information sources that can be used to obtain population data to construct a population pyramid. Some candidates described in detail how population estimates or projections are prepared, which was not asked for and therefore did not gain credit.

Some incorrectly emphasised the influence of cause-specific mortality such as work related accidents as major determinants, or described life expectancy as being a separate and additional influence on top of mortality rates. The implication of the changing population pyramid on health policy was generally not well answered, although many candidates commented on social policies such as the impact on taxation.

Good answers included a really good description of the reasons for the differences underlying the structures of historic and current population pyramids.

Question 6

- a) Describe briefly the following measures:
- i) Disability Adjusted Life Years (DALYs) (30% of marks)
 - ii) Potential Years of Life Lost (PYLL) (30% of marks)
- b) Using osteoarthritis and lung cancer as examples, how might an assessment of the burden of disease in a population appear to differ using these health measures? (40% of marks)

KEY POINTS

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

- a)
- **DALYs.** The DALY (disability-adjusted life year) measure combines the (estimated) number of life years lost (YLL) due to premature death and the number of future years lived with disability (YLD) using a set of disease specific empirical weights to value the level of disability following standardised methods. These were derived from the Global Burden of Disease (GBD) Study which provided quantitative, internally consistent estimates of the burden of disease, including non-fatal outcomes, attributable to 107 causes, per sex, for different age groups and per region in the world for 1990.
 - **PYLL.** This measure attempts to quantify the potential years of life lost by looking at average age at death from conditions compared to an arbitrary age, say, 75 years, or the average life expectancy. The PYLL due to death can be calculated for each person who died before age 75. For example, a person who died at age 20 would contribute 55 potential years of life lost. Deaths occurring in individuals age 75 or older are not included in the calculation. Potential years of life lost correspond to the sum of the PYLL contributed for each individual. The rate is obtained by dividing total potential years of life lost by the total population less than 75 years of age. PYLL can also be calculated for age-groups. PYLL provides information on the impact of a certain illness/ condition leading to death on society in general, e.g., accidents, HIV. Deaths within first year of life are not counted by some workers as many causes are considered “unavoidable”.
- b) For lung cancer, PYLL may be quite high as deaths, although relatively infrequent, can occur at a young age. For osteoarthritis, the condition has a low mortality but high prevalence. So PYLL will be low.

DALY scores for osteoarthritis are higher than for lung cancer, partly because of the higher prevalence of osteoarthritis but mainly its impact on pain and function over a longer period of time, leading to a high number of years lived with disability (YLD). In contrast for lung cancer the time from onset to death is relatively short and with a relatively high case fatality rate this leads to fewer individuals in a disabled state in association with their cancer.

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

- A well-structured answer illustrating the importance of understanding how different measures of health status are derived and applied to influence health policy.
- Discussion about how DALY and PYLL measures can be used to illustrate the burden of disease (premature mortality and/or disability) that results from exposure to various risk factors, and also highlighting potential interventions to reduce the occurrence of the condition or its severity or outcome.
- DALYs can also be used to assess the cost-effectiveness of interventions.
- Later rounds of the GBD project have looked at risk factors as well as disease and injury, considerably extending its value to the public health agenda.
- The GBD analyses are based on a model life table approach.

EXAMINER COMMENTS

The first part of the question was in general very poorly answered and many candidates did not demonstrate an understanding about how the DALY was calculated. Instead, they made vague descriptions of the term without clearly commenting on the two separate components of years of life lost (YLL) and years lived with disability (YLD). Candidates who did well on this question were able to describe how the YLL and YLD are calculated, and were also able to discuss the particular strengths and uses of the DALY measure.

The question on PYLL required a simple answer and was much better handled by the majority of candidates.

Some candidates referred to QALY as well. Since this is not being asked, there is no advantage in introducing another term for which no credit was gained.

Question 7

Write short notes on the following:

- a) Social justice (33% of marks)
- b) The inverse care law (33% of marks)
- c) Thresholds of admission (33% of marks)

KEY POINTS

a) Social justice

The idea that social policies are based or should be based on a set of values concerning:

- The worth of every citizen
- Equality of opportunity / life chances
- Entitlements or rights to basic services
- Reduction of unfair inequalities

Outline the principal theories / theoretical frameworks for social justice:

- Utilitarianism (Bentham)
- Distributive justice (Rawles)
- Procedural justice (different from legal and administrative justice)

Explain key concepts:

- The “veil of ignorance” to determine what is considered “fair”
- Contrast of equality, (allocative) efficiency and equity
- Vertical equity (unequal provision for unequal need) and horizontal equity (equal provision for equal need)

Illustrating the relevance of these theories and concepts to existing policies affecting health and determinants of health in a named country or setting demonstrated a good understanding of concepts.

b) The Inverse Care Law

- Ascribed to Julian Tudor Hart.
- States that the quality and availability of health service resource is inversely related to need. Thus people living in areas of high deprivation and morbidity tend to have poorer quality and less service available than those in areas of high socio-economic status.
- E.g. provision of GPs and Health Visitors is negatively correlated with a number of indicators of need, such as stillbirth rate, infant mortality and births to teenage mothers.
- Generally true, but in inner city areas, provision of secondary care may actually be above average, although primary and community care is less adequate.
- Those with most need may have personal factors (health literacy, assertiveness, motivation) and face service factors (staff attitudes, expectations of worth) which militate against meeting their health service needs.
- Illustrate relevance to planning e.g. Health equity audits.

c) Threshold of Admission

This is of relevance when discussing variations in treatment rates. Describes the severity of illness which a patient experiences before admission to hospital is considered justifiable.

The threshold can vary between time and place, depending upon many factors:

- Availability of beds
- Variation between clinicians on the appropriate point of intervention/admission
- Perceptions of the value of the individual (age, sex, social class)
- Distance of home from hospital
- Availability of substitutes for inpatient care (home nursing, day care etc.)

- Personal qualities of patients e.g. tolerance to pain, whether the patient wants to be admitted

EXAMINER COMMENTS

The performance on this question was generally disappointing. Few candidates offered good quality answers to all three sections, and rarely were theoretical constructs related to real-life examples from public health policy or practice. The better answers were those with topical examples, such as the recent Marmot review (in part a), SureStart (part b) or peaks of demand such as a flu epidemic (part c). A few candidates linked one or more sections to concepts of need (including Bradshaw's taxonomy). This was not expected but was rewarded as it could be seen as a theoretical thread that unifies the three parts of this "short notes" question.

a) Some theoretical background was expected. However, many candidates failed to gain adequate marks because they introduced specialised terms or theories without proper definition or explanation, and without demonstrating that they understood the jargon. A general discussion of (in) equality and (in) equity gained few marks unless it was related specifically to social justice.

b) Tudor Hart's original "inverse care law" was developed in relation to the provision of health services (principally in primary care) whereas many candidates introduced a broader perspective – that of service uptake. While this was not penalised, the better answers were those that related to service provision, or commented on the limitations of the original concept.

c) Thresholds were often linked inappropriately to clinical guidelines. More was expected on the effect of admission/referral/presentation thresholds on epidemiological comparisons (time trends, geographical differences) and service planning (including seasonal bed crises) based on routine admission statistics.

Question 8

Compare and contrast the components that should be included in assessing the economic costs of a seasonal influenza epidemic and a worldwide influenza pandemic.

KEY POINTS

Seasonal Flu

- Outbreaks are predictable and seasonal; usually in the winter
- There is usually some immunity from previous exposure.
- Healthy adults are usually not at risk; primarily affects the elderly, the very young, and the chronically ill.
- The public health system can meet patient needs.
- Vaccine is available and usually very effective.
- Adequate supplies of antivirals are usually available.
- Symptoms include:
 - fever
 - cough
 - runny nose
 - muscle pain
 - deaths usually occur from complications such as pneumonia
- Modest impact on society (e.g., school closing and sick people stay home from work)
- Minimal impact on world economy

Pandemic Flu

- Occurs rarely (3 times in the last 100 years)
- Because there is no previous exposure, there is no existing immunity
- Even healthy people are at risk
- Number of cases could overwhelm the health care system
- No vaccine until later in the pandemic
- Limited supplies if any effective antivirals
- Deaths could number in the millions worldwide
- Symptoms are more severe with more complications
- Major impact on society (e.g. widespread school and business closings, quarantines, travel restrictions)
- Impact on business sectors due to social distancing and quarantine arrangements.

Costs in economic appraisal may be broadly classified as 'direct' or 'indirect' (to a named entity) and 'tangible' or 'intangible'.

Direct and tangible costs to the NHS health system would include:

- In-patient: number of additional bed days, investigations, procedures, drugs, cost of any additional drugs including oseltamivir (Tamiflu®), wages of doctors, nurses, and others involved in care.
- Opportunity costs – foregone use of resources for alternative patients, needs to be included. A portion of the hospital overheads, management function, and capital assets should also be included.

- Community: most people would be dealt with in the community and not in hospital; costs of GPs, practice nurses, and district nurses; drugs, and equipment; hospital out-patients dept, and transport. Costs of immunisation of vulnerable groups. Opportunity costs to the primary and community sector also need to be included.
- Direct costs of infection control system - surveillance of infections; the hospital infection control team; the lead director for infection control; wider surveillance of infections by Health Protection Agency.

Direct and tangible costs to Local Authority Social Care system might include social assessments, social care support or enhanced community support, e.g. day services. (Opportunity costs and overheads apply as above.)

Tangible costs to the individual(s) with flu include: foregone paid employment, costs of additional child care

Tangible costs to informal carers – as for the individual, especially if a relative.

Intangible costs include mortality from flu; pain and suffering; foregone leisure time; diminished quality of life borne by individual(s) and others (e.g. family, friends)

Costs to society from loss of productivity and the cost of caring activities. Differs between seasonal and pandemic flu in relation to incidence and case-fatality in different age-groups (younger, more economically productive groups affected in pandemics) and high-risk groups (impact on carers in seasonal epidemics; carers themselves, including health service personnel, affected in pandemics).

Major issues around business continuity in provision of key services during a pandemic – public utilities such as electricity, water and emergency services – these are of lesser concern during seasonal epidemics.

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

Clearly defining the perspective for calculating costs: patient v health service v society as a whole; local v national v global.

Balanced comparison and contrast, selecting examples relevant to each type of influenza.

Discussion of how intangible costs might be measured.

There are major issues around business continuity in provision of key services – public utilities such as electricity, water and “blue light” services. This would be more important in a pandemic, not relevant for a seasonal epidemic

EXAMINER COMMENTS

Most candidates offered mediocre answers to this highly topical question. A few gained almost no marks because they answered a different question. The exam paper related to the assessment of economic costs of events (epidemics), not to the comparative economic evaluation of policy options or interventions.

Many candidates (appropriately) adopted the framework of direct v indirect and tangible v intangible costs, and/or included mention of opportunity costs. Concepts of fixed v variable and average v marginal costs were sometimes included. Although less relevant, they were not penalised. Candidates who tried (erroneously) to structure their answer around cost-minimisation, cost-utility, cost-effectiveness and/or cost-benefit analysis chose an inappropriate framework and usually gained few marks.

Tabular presentations were not uncommon. Although this offered a structural framework for the “compare and contrast” which was given some credit, the content of the table was often very terse, consisting of bullet points with one or two words attached to each. A table alone, without accompanying textual commentary, gained little credit.

Question 9

Tobacco use is the greatest preventable cause of death in the world, affecting both developed and developing countries.

- a) What are the policies and actions that governments can implement effectively to reduce tobacco use. (70% of marks)
- b) What can international organizations do to decrease tobacco use on a global scale? Please illustrate your answer with an international organisation of your choice..(30% of marks)

KEY POINTS

Tobacco use is the single greatest preventable cause of death in the world, which kills 5.4 million people a year from lung cancer, heart disease and other illnesses. If trends continue, it is expected to kill one billion people by the end of this century, more than 80% of which will occur in developing countries, widening the health gap globally.

Extensive research exists to support tobacco control policies, and candidates are expected to list the effective policies and actions. The following is a framework advocated by WHO which can be summarised under the acronym MPOWER. Other frameworks, for example under health promotion theories, or supply / demand reduction models are also accepted.

M - Monitor tobacco use and prevention policies.
Assessment of tobacco use and its impact must be strengthened.

P - Protect people from tobacco smoke.
There is good evidence that second-hand tobacco smoke is harmful, and smoke-free policies should be advocated.
Smoke-free policies in the workplaces of several industrialized nations have reduced total tobacco consumption among employees by an average of 29%.

O - Offer help to quit tobacco use.
Among smokers who are aware of the dangers of tobacco, three out of four want to quit. Most smokers benefit from help and support to overcome their dependence. Countries' health-care systems should provide treatment for tobacco dependence.

W - Warn about the dangers of tobacco.
Graphic warnings on tobacco product packaging deter tobacco use. Pictorial warnings should cover at least 30% of the principal surface area. Prevent the use of misleading and deceptive packaging terms such as "light" and "low-tar" - none of which actually signify any reduction in health risk.

E - Enforce bans on tobacco advertising, promotion and sponsorship.
About half of the children of the world live in countries that do not ban free distribution of tobacco products. National-level studies before and after advertising bans found a decline in tobacco consumption of up to 16% following prohibitions.

R - Raise taxes on tobacco.
Price elasticity factor - increasing tobacco taxes by 10% generally decreases tobacco consumption by 4% in high-income countries and by about 8% in low- and middle-income countries. A 70% increase in the price of tobacco would prevent up to a quarter of all tobacco-related deaths among today's smokers.

International Organisations on Tobacco Control

The spread of the tobacco epidemic is facilitated through a variety of complex cross-border factors, including trade liberalization, direct foreign investment, global marketing, transnational tobacco advertising, promotion and sponsorship, and the international movement of contraband and counterfeit cigarettes.

An example of international organisation on tobacco control would be the World Health Organization (through the Tobacco Free Initiative (TFI)). The WHO FCTC (Framework Convention on Tobacco Control) entered into force in 2005 and is the most widely embraced treaty in UN history. Other examples are accepted.

The roles of international agencies range from providing resources, supporting research, setting evidence-based standards, monitoring national tobacco use surveillance and control policies, to providing technical expertise to individual governments to develop national tobacco control plans, pass and enforce key laws and implement effective policies and tobacco control measures.

Desirability of partnerships with NGO and anti-tobacco advocates in effective formulation and implementation of government policies and actions including legislative measures.

EXAMINER COMMENTS

This was a generally well answered question.

Whilst few candidates specifically described the “MPOWER” acronym, most candidates derived the majority of factors empirically. Better answers incorporated social marketing principles, considered illicit tobacco and made linkages with wider policies.

On terminology: Some candidates used “tobacco use” and smoking interchangeably. Although no marks were deducted because smoking is the most common form of tobacco use, tobacco use is a broader term, as tobacco can be smoked, sucked, chewed or snuffed. On “Protecting people from tobacco smoke”, it should be noted that voluntary smoke free policies have been shown to be ineffective and do not provide adequate protection. Legislation is necessary to protect people from exposure to tobacco smoke.

Question 10

- a) Define risk and explain how it is relevant to a health care system. (30% of marks)
- b) Describe one technique used to assess and minimise risk within a defined healthcare organisation of your choice. (70% of marks)

KEY POINTS

Risk (definition):

- avoidable or preventable incident
- identify possible hazards in the system.
- culture, processes and structures
- evolutionary- builds on past experiences

Settings (examples):

- acute hospital
- health care commissioning agency
- ambulance service
- mental health provider
- Provider services
- primary care service- is not technically a health care organisation (HCO)

Relevance of risk to health care system:

- underpins patient care and health and wellbeing of its staff and visitors;
- enables delivery of HCO's vision through best use of health care system resources
- corporate responsibility to lead;
- everyone's business to understand;
- key component of well managed programmes
- essential component of good governance and assurance processes

can be thought of as risks to:

- success [clinical and cost effectiveness] of HCOs,
- reputation,
- financial
- business-critical deliverables
- safety
- staffing issues
- estates
- IT
- confidentiality

Should mention any national litigation mitigation schemes (e.g. NHSLA) and links to good governance and overall reputation of a the health care system;

Techniques to minimise risk:

- 1.-systematic and structured risk management framework;
 - use of agreed methodology to analyse range of potential consequences and likelihood of risks using the standard classification 5x5 likelihood vs impact matrix;
 - recognition of spectrum of risk: low-moderate-high-very high;
 - Action Plans to manage / minimise significant levels of risk (high or very high)
 - Root cause analysis to identify system factors, and human factors to manage risks

- 2.-collation of risk information in a consistent format

- use of risk registers
- appropriate reporting mechanisms to provide assurance of effective management of risk

3.-cultural factors within organisation:

- open and transparent practices
- clear policies
- ‘no blame’ culture
- accurate, timely data which is actively used by staff and management (scrutiny culture)
- clear accountabilities
- upwards reporting systems are clear
- audit and feedback with demonstrable success in reducing risk

Additional points could be awarded for:

- accurate description of well known case study (e.g. Bristol)
- detailed knowledge of national litigation mitigation schemes membership, its levels and the discount scheme if HCOs demonstrate high level compliance
- links clearly made to overall governance
- Example of risk reporting in HK: under the Advance Incident Reporting System (AIRS), Hospital Authority staff can make timely reports of medical incident through HA’s internal electronic system. There are also some electronic risk registers between some hospital clusters to monitor and review the complaints systems.

EXAMINER COMMENTS

Overall this was a quite well answered question. Better answers gave well structured contextual answers although many answers were unstructured and lacked sufficient detail.

Many candidates appeared to confuse ‘risk’ with ‘likelihood’ and did not explain it well in the context of a health care system.

In general, there was a lack of clear articulation of risk assessment and minimisation techniques.

Clinical governance and/or clinical audit were frequently cited as techniques- but reliance on these, even when described well, gave a narrow and rather incomplete answer to the broader aspects of the question.

Most candidates did not mention standard risk management tools. Only about a quarter of candidates mentioned the use of risk registers. Very few candidates mentioned ‘root cause analysis’ and even fewer specifically cited the NHSLA (UK) or the AIRS (HK);

Paper IIA

You have been asked to lead the work of your healthcare organisation in tackling cardiovascular disease (CVD), with a focus on reducing associated inequalities, through primary prevention. You consider the enclosed paper published in the BMJ (in which references to the United Kingdom/UK should be taken as being your home nation) to help you formulate some advice on which tool to use to estimate CVD risk.

Hippisley-Cox J, Coupland C, Vinogradova Y, Robson J, May M, Brindle P. Derivation and validation of QRISK, a new cardiovascular disease risk score for the United Kingdom: prospective open cohort study. *BMJ* 2007;335:136-41.

1. Write a critical appraisal of the paper. (40% of marks)
2. Explain in more detail the parameters and results presented in Table 2. How might R^2 and other measures of the performance of the QRISK algorithm be increased now and in the future and why will the R^2 value never reach 1.00? (25% of marks)

The standard Framingham algorithm uses age, sex, systolic blood pressure, diabetes, smoking status and cholesterol levels, and is based on incidence data from a cohort in north-east USA. ASSIGN was derived from data on CVD incidence in Scotland and included deprivation in addition to biomedical risk factors. Your Family (General) Practitioners are now paid to collect and record data on smoking status and BMI and are expected to record ethnic origin.

3. Write a report for the Chief Executive of your healthcare organisation stating the most important issues and criteria around the choice of a CVD risk algorithm for current and future use in your home nation, and your recommendations for a tool based on these criteria. (25% of marks)
4. Assume a relative risk reduction of 30% with a statin (cholesterol lowering medication), irrespective of absolute risk. At a 20% 10-year CVD risk, what is the average number needed to treat (NNT) with a statin for 10 years to avoid one CVD event? (10% of marks)

KEY POINTS

Q1 Critical appraisal

This should demonstrate a systematic approach that covers the following areas:

Did the study ask a clearly focussed question? Is there a clear rationale for the study?

- The limitations of the current evidence base and the aims of the current analysis are clearly defined.

What type of study was this and was the choice appropriate? Has the strongest study design, appropriate to the research question, been used?

- This was a population-based retrospective (retrospective because the analysis is based on patients followed up during time already elapsed, not prospective as stated in the manuscript text) cohort study based on a large primary-care automated database. The authors computed multivariable hazard ratios for CVD for a number of risk factors/predictors in order to produce 10-year CVD risk equations according to baseline patient characteristics. A population-based cohort is an entirely appropriate design for this type of prognostic research.

What was the target population? Was the study population representative of the target population?

- The target population was UK (your home nation) men and women aged 35-74 years. The study population was an essentially randomly selected population determined by registration with GP practices that used a specific type of GP software. The population studied is only 16% of the UK and may not be representative. However, comparison with the health survey for England suggested that the studied population was fairly representative of the UK population (probably as good as is possible) and the study population was 'socially, ethnically and geographically' diverse, including both men and women. It also has the advantage of being a contemporary population, unlike the Framingham cohort on which an established risk equation is based.

How were CVD risk factors measured? Could the measurement of risk factors have been biased?

- Risk factors were measured from routine GP computerised records, prior to the outcome, so the recording of risk factors is unlikely to be biased with respect to outcome. However, some risk factors were measured relatively crudely (e.g. a one-off measure of blood pressure; area measures of deprivation and ethnicity) which could have led to non-differential (random) misclassification and attenuated effect-estimates. Furthermore, recording of data in routine practice is subject to variations in interpretation and definitions. As expected in a routine automated database, data were missing, and the levels of missing data were high for serum cholesterol, which is potentially problematic. As subjects with missing cholesterol data had higher survival rates, this may have attenuated effect estimates for serum cholesterol in relation to CVD risk. A strength of the study, however, was the use of multiple imputation of missing values to account for differences in survival for patients with and without missing data.

How was the CVD outcome measured? Could the measurement of CVD outcome have been biased?

- The primary CVD outcome was based on doctor diagnosis of CVD, which was not validated and was likely to have been misclassified in a proportion of participants. The impact of such misclassification of outcome would depend on whether outcomes were over- or under-ascertained in a non-differential (random) or differential manner. Such misclassification may vary by risk factor studied. For example, CVD may have been under-ascertained amongst participants from more deprived areas.

Was outcome assessment blind to exposure status?

- No, leading to possible differential misclassification of outcomes for some exposures.

Could the results be explained by chance?

- The study population was extremely large thus random variation should not have been a problem, apart from the relatively short follow-up period that was less than 10 years for most participants. Where missing data were large, multiple imputation was used which would maintain the power of the study.

Are the results consistent?

- A validation cohort was drawn from a separate group of practices to the derivation cohort and was used to test the model and to compare predicted versus observed risks. Alternative algorithms were then tested against the same population and the associated actual events. This separate validation is a strength of the study. However, all practices were users of a particular computer software package so were not entirely 'independent' and a second validation is underway using an entirely separate automated database.

Was follow-up complete?

- Follow-up was relatively short: only 306,259 of 1,283,174 (24%) participants were followed up for 10 years, potentially leading to imprecise estimates of survival at 10 years.
- Linked deaths data were only available for 5 years of the study period, but this represents only a small proportion of all CVD 'events'.

Was the statistical analysis clearly described and appropriate?

- Standard statistical analyses were used for the mixed variables: Cox proportional hazards models were applied to categorical and continuous (both linearly and non-linearly distributed) variables and a priori defined interactions were tested for.
- The performance of all algorithms were tested by three statistical methods: ROC, D statistic and R^2 . These all provide summary measures of discrimination and explained variation appropriate at the population level. Missing data are a major problem with this study but this was dealt with by a standard methodology.

Are the results of clinical or public health significance?

A point of excellence relates to recognising the CLINICAL importance (i.e. for treating individual patients) of comparing performance at the threshold: the paper does not provide that information (i.e. what proportion of the patients who actually suffered an event were identified as high risk, >20%, by each algorithm; and was there any difference by deprivation).

Did the study have ethical approval? Who sponsored the study? Were there any conflicts of interest?

- The study had ethical approval and conflicts of interest were openly declared.

Q2 Table 2

The Receiver Operator Curve (ROC) is a graphical plot of sensitivity (true positives) versus (1-specificity) (false positives). The 'area under the curve' (AUC) is a measure of the ability of the algorithm to discriminate between patients who will and will not have a CVD event. It is 1.00 for a perfect classification (100% sensitivity and 100% specificity i.e. no false negatives and no false positives) and 0.5 for no discrimination at all. An algorithm with an AUC value of 0.7 to 0.8 is considered to have reasonable discrimination.

R^2 measures the amount of variation explained by the algorithm with 1 (100%) indicating that everything is predicted by the algorithm.

R^2 can be improved by more complete and accurate data or by adding more known risk factors to the algorithm. An R^2 of 1.00 cannot be reached if there is random sampling variation, misclassification of exposure or outcome or unknown or un-measurable risk factors.

Q3 Recommended CVD risk algorithm

QRISK uses contemporary UK (your home nation) and population-based data and includes important additional risk factors such as deprivation, family history and current treatment. The QRISK data set is very large, allowing the computation of statistically reliable models. Once implemented, the use of QRISK could encourage the collection of more complete and accurate data allowing the algorithm to be recalculated based on higher quality data. Computerisation of healthcare systems means that 'calculators' can be built into automated clinical systems. It might be considered important to have data from an external validation before unequivocally recommending QRISK.

ASSIGN: Scottish data are on a population known to have overall high CVD rates and so are also not calibrated to the other UK (your home nation) populations. Recalibration is possible but may be crude.

Framingham is easier to use in the absence of computers, because it uses fewer risk factors, but the ease of use comes with the risk of higher rates of misclassification. It uses USA data that may not be generalisable to the UK (home) setting, is based on data from 30-50 years ago (at the peak incidence of CVD in the USA), was ethnically homogeneous and does not include important risk factors such as deprivation and current treatment.

Q4 Number needed to treat

The number needed to treat with a statin to prevent one CVD event in 10 years is 17.

EXAMINER COMMENTS

Overall answers were good for this paper. Although some candidates struggled with questions 2 and 4, most answered these questions to a satisfactory or good standard. Candidates who scored highly had well structured answers for the critical appraisal, which ensured that key points were broadly covered. Unstructured critical appraisals with little assessment of the impact of various limitations on the interpretation of the results scored less well.

Only a minority of candidates commented fully on potential misclassification of risk factors and outcomes and the subsequent potential for information bias; also only present in a minority was the potential impact of loss to follow-up bias, an important consideration in any cohort study. It is important for candidates to clearly distinguish between generalisability (related to whether the study population is representative of the target population) versus selection bias (a systematic difference in the likelihood of selecting subjects to take part in the study on the basis of their association between both exposure and outcome). It is also important to be aware that having a large sample size does not prevent bias - in the presence of bias, a large sample size simply makes biased estimates look more precise.

Question 2: For some, responses to this question could have been improved by commenting more fully on what the results showed in relation to the 3 algorithms.

Question 3: good answers had a clear structure, starting with a precise section delineating the "Purpose" of the report; clearly explained the rationale for risk algorithms; compared strengths and weaknesses of the chosen algorithm versus the others; and well thought out recommendations that reflected good public health practice.

Question 4: some candidates who didn't quite get the maths correct, might have been helped by stating the definition of NNT and its formula (don't just state $1/ARR$ in shorthand; state that you know what is meant by 'ARR').

Paper IIB

In its new format Paper IIB questions, key points and detailed examiner comments on each section will not be released.

GENERAL EXAMINER COMMENTS

In this, the first sitting of the new format Paper IIB, the overall performance on the paper was good with most of the sections having been generally well answered. There was a wide spread of marks and candidates demonstrated that it is possible to gain good and very good marks on this paper. Whilst some candidates performed badly, most candidates answered most sections adequately or more than adequately. Candidates should pay close attention to questions where there is a clear indication of the length of answer required. Where the length of the answer is not explicitly indicated candidates should pay close attention to the number of marks offered for each part of a section as an indication of the length of answer required.