

**UNIVERSITY OF WALES COLLEGE OF MEDICINE**

**MASTER OF PUBLIC HEALTH**

**WEDNESDAY, 12TH MAY 2004**

**Paper 1A**

*PUBLIC HEALTH POLICY*

You should answer **FOUR** questions: equal marks are given to each question.

**ONE** from Section A : Determinants of Health

**ONE** from Section B: Health Economics

The **COMPULSORY QUESTION** and **ONE OTHER** from Section C: Health Policy and Management

Credit will be given for evidence of critical thinking and for answers which are illustrated by reference to the literature and, where relevant, to your own experience.

**PLEASE USE A SEPARATE ANSWER BOOK FOR  
EACH QUESTION**

## ***Section A: Determinants of Health***

### ***Answer one question***

***Please use a separate answer book for EACH question***

1. What is 'public health'? (5 marks) How are social values reflected in public health practice? (20 marks)
2. What is meant by 'health inequality'? (5 marks) What is meant by 'social class'? Explain the limitations of the concept of social class. (10 marks) Describe and explain the public health situation expressed in table 1 (10 marks)

**Table 1** Trends in health inequality, England and Wales, 1931 – 1991: annual deaths per 100,000 in each Registrar-General's Social Class (RGSC) in men aged 25 – 64.

Age	Year	Registrar-General's Social Class			
		I	II	IV	V
25-34	1931	288	283	360	374
	1951	147	112	172	224
	1961	82	81	119	202
	1971	65	73	114	197
	1981	54	62	106	204
	1991	39	57	96	187
35-44	1931	439	468	609	667
	1951	241	232	291	417
	1961	166	177	251	436
	1971	168	169	266	394
	1981	114	131	233	404
	1991	101	111	195	382
45-54	1931	984	1,021	1,158	1,302
	1951	792	706	725	1,041
	1961	535	545	734	1,119
	1971	506	564	818	1,069
	1981	398	462	728	1,099
	1991	306	314	545	916
55-64	1931	2,237	2,347	2,340	2,535
	1951	2,257	1,957	2,105	2,523
	1961	1,699	1,820	2,202	2,912
	1971	1,736	1,770	2,362	2,755
	1981	1,267	1,439	2,082	2,728
	1991	953	1,002	1,620	2,484

Source: Blane, Bartley and Davey Smith, 1998

### ***Section B: Health Economics***

***Answer one question***

***Please use a separate answer book for EACH question***

3. Current policy in country X is to offer hepatitis B immunisation only to individuals deemed to be at high risk. A proposal has been made to expand the programme to also include lower risk groups.

Describe and defend what you consider to be the most appropriate technique of economic appraisal to evaluate this proposal. What factors should the economic appraisal consider? (25 marks)

4. “All health care decisions should be made solely on evidence of effectiveness. It is unethical to take costs into account when making health care decisions.”

How would an economist defend the ethicality of the inclusion of costs in health care decision making? (25 marks)

### ***Section C: Health Policy and Management***

***Answer question 5 which is compulsory, and one from the remaining questions)***

***Please use a separate answer book for EACH question***

#### **5. Compulsory question**

You have accepted the role of manager for a project funded by a major international development agency. For 8 weeks you will be responsible for a small team who will prepare a project proposal which must be agreed with the agency and the local regional government. The project’s scope is “to use most effectively a £10 million grant over a 3 year period to address the priority health needs of the affected area”.

Three months ago serious flooding caused a dam to breach and water inundated a middle sized industrial city of 1 million population and the surrounding agricultural area where another half million people live, either producing food on small scale farms or travelling to the city to work. The area’s infrastructure was badly affected, many homes were destroyed, water and sanitation services have been compromised; full power supply has not returned to the city; one large international manufacturer of sports goods has pulled out of the region; schools, hospitals and other services have all suffered. The regional and central government is not rich and the city and surrounding areas traditionally has tended to support politicians in the opposition party.

Your team will consist of one epidemiologist, yourself as team leader/ public health specialist, one finance specialist and three local support staff with community nursing/data collection skills.

Outline how you will set about identifying the priority health care needs of the population; what information will you want your team to collect; any particular approaches you would want them to employ (13 marks) . What sorts of problems would you anticipate in developing a technically sound assessment which will satisfy the expectations of the various key stakeholders? (12 marks).

**(25 Marks)**

Answer **one** question from the following three.

6. *The funding of health services in many countries (e.g. the British NHS) is predominantly through general taxation. Describe the main strengths and weaknesses of this approach to funding health care services. (25 marks)*

*(Marks equally allocated for strengths and weaknesses)*

7. In recent years there has been a trend in many countries towards decentralisation of health service policy making and management. Should communities have a greater say in deciding local health priorities or does this undermine attempts to provide nationally consistent services and reduce inequalities? Discuss. (25 marks)

8. If a country's health services are facing problems, what sorts of international assistance are available to it? (12 marks)  
What sorts of problems would a country face in using such assistance? (13 marks).

**UNIVERSITY OF WALES COLLEGE OF MEDICINE**  
**MASTER OF PUBLIC HEALTH**  
**WEDNESDAY, 5 MAY 2004**  
**10-12:30**

**Paper IB**  
*STATISTICS*

You should attempt *all five* questions in this paper for which 2½ hours are allowed. If you find you are spending a lot of time on one question you are advised to move on to the next one - to guide you in this the marks available for each question are indicated. We suggest you use 10 minutes to read the paper at the start, and reserve 10 minutes to check at the end. Note that a substantial proportion of marks are awarded for clear interpretation or comments. There is **no** credit for performing calculations other than those explicitly requested. For calculations that are required, you may use a calculator, but you should include details of your working, including relevant intermediate steps. Some useful formulae together with standard statistical tables and a nomogram are appended.

**Question 1**

Attendances at hospital Accident & Emergency (A&E) Units for injuries in the home over a 2 year period in residents of the borough of Neath Port Talbot were studied. The proportions of male and female residents who attended an A&E Unit during the study period were as follows.

Gender	No. in population	Proportion ever attending A&E unit
Males	55277	12.1%
Females	56971	13.0%

- (a) A 95% confidence interval for the difference in proportions attending was 0.5% to 1.3%, with  $\chi^2 = 21.0$ ,  $p < 0.001$ . Explain what should be inferred from these results.

9 marks

- (b) Calculate the relative risk and the odds ratio expressing the risk in females relative to that in males. Is the relative risk an acceptable measure here? Explain under what circumstances the relative risk is acceptable, and under what circumstances it is not.

12 marks

Total 21 marks

### Question 2

The following figures are extracted from the current life table for males, England & Wales 1999.

Age in years	Number surviving at exact age x
0	10,000
1	9,897
2	9,888
...	...
5	9,864
...	...
70	5,428
...	...

(a) For 2 boys reaching age 5 in 1999, estimate the probability that both of them will reach age 70.

4 marks

(b) Explain what assumptions are made in performing this calculation. What difference would it make if you were told they were a pair of twins?

6 marks

Total 10 marks

### Question 3

A crossover study evaluated the effect of supplementing the diet with folic acid, a vitamin in the B complex which is believed to be important for prevention of birth defects and heart disease. For one period of 4 months, 105 volunteers took one folic acid capsule daily. For another 4 month period, they took a matching placebo capsule. The order in which the capsules was given was randomised. Participants were instructed to continue their normal diet throughout. The following results were obtained for levels of riboflavin (vitamin B2), another vitamin in the B complex, in blood samples taken at the close of each 4 month period.

Period	mean	SD	median	minimum	maximum
Supplement	8.47	6.05	6.61	2.04	31.99
Control	9.13	6.57	7.12	1.78	39.07
Difference	-0.66	2.69	-0.76	-9.56	7.68

(a) What hypothesis test is appropriate to use here to examine the effect of folate supplementation on the riboflavin level, and why?

4 marks

(b) Perform your chosen test and interpret your findings.

14 marks

(c) What alternative test might be considered for use here, and why?

5 marks

**Question 4**

Standard instructions for giving cardio-pulmonary resuscitation (CPR) to a victim who has collapsed with a heart attack involve using mouth-to-mouth respiration and chest compression alternately. It is thought that there may be advantages in using chest compression only.

In an experimental study, untrained volunteers were presented with a manikin (a dummy resembling a collapsed person) and given resuscitation instructions by telephone. They were randomly allocated to receive either standard CPR instructions or compression-only instructions. Several outcomes were studied. The following results were obtained for the compression rate per minute achieved.

Group	Number of volunteers	Compression rate (compressions per minute)	
		Mean	SD
Compression-only CPR	29	87	26
Standard CPR	31	72	30

- (a) Obtain a 95% confidence interval for the difference in compression rate between the two groups, and explain how it should be interpreted.

12 marks

- (b) The investigators plan to perform a similar study involving slightly different instructions. They decide to aim for an 80% power to detect a difference in compression rate of 10 compressions per minute between the two groups at a 5%  $\alpha$  level. Explain what is meant by a power of 80% in this context, and why power assessment is important.

5 marks

- (c) How many volunteers should be used for the new study?

7 marks

Total 24 marks

### Question 5

As part of a Health Promotion evaluation, a large series of adults were assessed for problem levels of alcohol drinking using questionnaire based screening tests. Four tests were used, a long questionnaire G which is regarded as the definitive gold standard, and three brief questionnaires A, B and C which the study aimed to compare. Each test classifies subjects as positive (problem drinkers) or negative (no drinking problem). Subjects were randomised to receive either questionnaire A, B or C, which was in each case followed by questionnaire G. The following results were obtained for the sensitivity and specificity of tests A, B and C relative to classification by G.

Test		Estimate	95% confidence interval
<i>A</i>			
	sensitivity	269/290 92.8%	89.2% to 95.2%
	specificity	404/461 87.6%	84.3% to 90.3%
<i>B</i>			
	sensitivity	122/303 40.3%	34.9% to 45.9%
	specificity	422/432 97.7%	95.8% to 98.7%
<i>C</i>			
	sensitivity	175/250 70.0%	64.1% to 75.3%
	specificity	371/439 84.5%	80.8% to 87.6%

- (a) Explain what the sensitivity and specificity figures for test A mean, and how the confidence intervals should be interpreted.

7 marks

- (b) Without performing further calculations, describe the differences in performance between:

(i) Tests A and B

4 marks

(ii) Tests A and C.

4 marks

- (c) What would be the PPV of test A when applied to Accident and Emergency Unit attenders, among whom the prevalence of problem drinking is 30%?

5 marks

- (d) Explain how this figure would alter if test A was applied in general practice, in which the prevalence of problem drinking is much lower.

2 marks

Total 22 marks



Some useful formulae.

Standard error of  $\bar{X}$   $SD / \sqrt{n}$

Standard error of  $p$   $\sqrt{p(1-p) / n}$

Standard error of  $\bar{X}_1 - \bar{X}_2$   $\sqrt{s_1^2 / n_1 + s_2^2 / n_2}$

Standard error of  $p_1 - p_2$   $\sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}$

$t$  (paired)  $\frac{\bar{d}}{SE(\bar{d})}$

$t$  (independent samples)  $\frac{\bar{X}_1 - \bar{X}_2}{se(\bar{X}_1 - \bar{X}_2)}$

Chi-square test  $\chi^2 = \sum \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}}$

1- $\alpha$  confidence intervals:

For  $\bar{X}$   $\bar{X} \pm t_\alpha \times SE(\bar{X})$

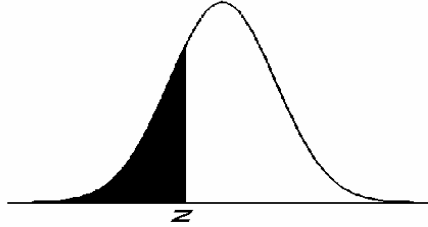
For  $\bar{X}_1 - \bar{X}_2$   $\bar{X}_1 - \bar{X}_2 \pm t_\alpha \times SE(\bar{X}_1 - \bar{X}_2)$

For  $p$  (simple method)  $p \pm z_\alpha \times SE(p)$

For  $p_1 - p_2$   $p_1 - p_2 \pm z_\alpha \times SE(p_1 - p_2)$

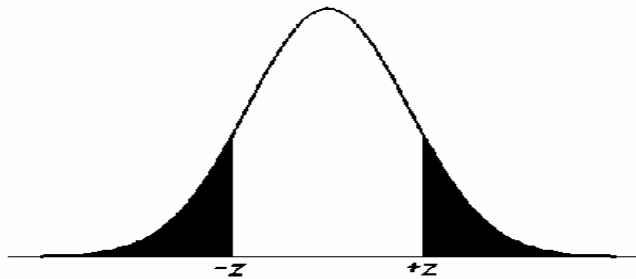
*Some useful values from Normal, t and  $c^2$  distributions*

Normal Distribution - one-tailed areas.  
 Proportion  $P(z)$  of the Normal distribution that lies below  $z$   
 where  $z$  is the standard Normal deviate



$z$	$P(z)$	$z$	$P(z)$	$z$	$P(z)$
-3.0	0.001	-1.0	0.159	1.0	0.841
-2.9	0.002	-0.9	0.184	1.1	0.864
-2.8	0.003	-0.8	0.212	1.2	0.885
-2.7	0.003	-0.7	0.242	1.3	0.903
-2.6	0.005	-0.6	0.274	1.4	0.919
-2.5	0.006	-0.5	0.309	1.5	0.933
-2.4	0.008	-0.4	0.345	1.6	0.945
-2.3	0.011	-0.3	0.384	1.7	0.955
-2.2	0.014	-0.2	0.421	1.8	0.964
-2.1	0.018	-0.1	0.460	1.9	0.971
-2.0	0.023	0.0	0.500	2.0	0.977
-1.9	0.029	0.1	0.540	2.1	0.982
-1.8	0.036	0.2	0.579	2.2	0.986
-1.7	0.045	0.3	0.616	2.3	0.989
-1.6	0.055	0.4	0.655	2.4	0.992
-1.5	0.067	0.5	0.691	2.5	0.994
-1.4	0.081	0.6	0.726	2.6	0.995
-1.3	0.097	0.7	0.758	2.7	0.997
-1.2	0.115	0.8	0.788	2.8	0.997
-1.1	0.136	0.9	0.816	2.9	0.998
-1.0	0.159	1.0	0.841	3.0	0.999

Some selected two-tailed percentage points of the Normal distribution



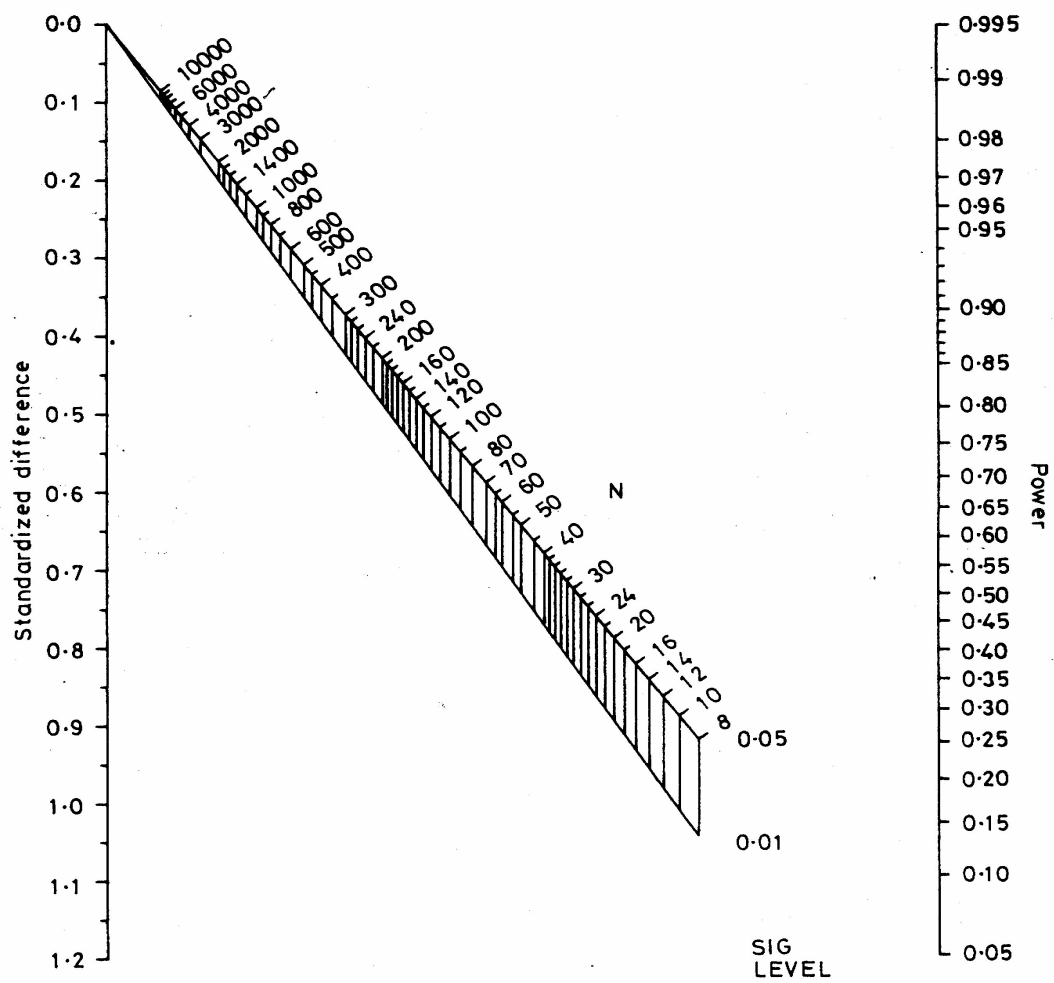
$P(z)$	0.5	0.2	0.1	0.06	0.05	0.02	0.01	0.001
$z$	0.674	1.282	1.645	1.881	1.960	2.326	2.576	3.291

Two-tailed percentage points of the t distribution

Degrees of freedom	Multiplier for confidence interval at level				
	90%	95%	98%	99%	99.9%
	Probability of obtaining a t-value which, when its sign is ignored, exceeds the tabulated value				
	10%	5%	2%	1%	0.1%
5	2.02	2.57	3.37	4.03	6.87
6	1.94	2.45	3.14	3.71	5.96
7	1.90	2.37	3.00	3.50	5.41
8	1.86	2.31	2.90	3.36	5.04
9	1.83	2.26	2.82	3.25	4.78
10	1.81	2.23	2.76	3.17	4.59
11	1.80	2.20	2.72	3.11	4.44
12	1.78	2.18	2.68	3.06	4.32
13	1.77	2.16	2.65	3.01	4.22
14	1.76	2.15	2.62	3.00	4.14
15	1.75	2.13	2.60	2.95	4.07
16	1.75	2.12	2.58	2.92	4.02
17	1.74	2.11	2.57	2.90	3.97
18	1.73	2.10	2.55	2.88	3.92
19	1.73	2.09	2.54	2.86	3.88
21	1.72	2.08	2.52	2.83	3.82
23	1.71	2.07	2.50	2.81	3.77
25	1.71	2.06	2.49	2.79	3.73
27	1.70	2.05	2.47	2.77	3.69
31	1.70	2.04	2.45	2.74	3.63
35	1.69	2.03	2.44	2.72	3.59
41	1.68	2.02	2.42	2.70	3.54
49	1.68	2.01	2.41	2.68	3.50
60	1.67	2.00	2.39	2.66	3.46
80	1.66	1.99	2.37	2.64	3.42
120	1.66	1.98	2.36	2.62	3.37
240	1.65	1.97	2.34	2.60	3.33
Infinity (Normal distribution)	1.64	1.96	2.33	2.58	3.29

Percentage points of the  $\chi^2$  (chi-square) distribution

Degrees of freedom	Probability that the tabulated value is exceeded				
	10%	5%	2%	1%	0.1%
1	2.71	3.84	5.41	6.63	10.83
2	4.61	5.99	7.82	9.21	13.82
3	6.25	7.81	9.84	11.34	16.27
4	7.78	9.49	11.67	13.28	18.47
5	9.24	11.07	13.39	15.09	20.52
6	10.64	12.59	15.03	16.81	22.46



Nomogram for sample size and power, for comparing two groups of equal size. Gaussian distributions assumed. (Reproduced from *Br Med J* 1980; **281**: 1336-8)

**UNIVERSITY OF WALES COLLEGE OF MEDICINE**

**MASTER OF PUBLIC HEALTH**

**WEDNESDAY, 19 MAY 2004**

**Paper 1C**

**EPIDEMIOLOGY**

**(including Demography and Social Research Methods)**

You should answer **FOUR** questions: equal marks are given to each question.

**TWO** from Section A: Epidemiology

**ONE** from Section B: Social Research Methods

**ONE** from Section C: Demography

Credit will be given for evidence of critical thinking and for answers which are illustrated by reference to the literature and, where relevant, to your own experience.

**PLEASE USE A SEPARATE ANSWER BOOK FOR  
EACH QUESTION**

The examiners reserve the right not to mark work that fails to comply with instructions

## SECTION A: Epidemiology

### Answer two questions

Use separate answer books for each question

1. A recent paper reports a study in which heart attack patients volunteered for (a) a course of intensive lifestyle modification (b) exercise-based rehabilitation or (c) usual care. Some key findings are summarized in the following table.

	Intensive (n = 28)		Rehabilitation (n = 28)		Usual care (n = 28)	
	Baseline <sup>x</sup>	change <sup>y</sup>	baseline <sup>x</sup>	change <sup>y</sup>	baseline <sup>x</sup>	change <sup>y</sup>
	mean (standard error)					
Body mass index	30.1 (1.0)	- 0.3(0.1)	28.5(1.0)	0.1 (0.1)	27.8(0.7)	0.0(0.1)
Systolic blood pressure	138 (4)	- 0.7(0.6)	128(3)	1.1 (0.6)	125(3)	1.8 (0.6)
Total cholesterol	157 (8)	- 2.2 (1.3)	149 (8)	0.7 (1.3)	134(7)	2.0 (1.3)
Angina frequency	14(3)	- 1.6 (0.5)	7 (3)	- 0.4 (0.5)	6 (3)	- 0.2 (0.5)

<sup>x</sup>baseline before joining relevant programme, <sup>y</sup>change between baseline and 6 month follow up.

Can you conclude that the trial shows that the intensive lifestyle modification programme led to improvements in body mass index, blood pressure, cholesterol and angina? Are there other interpretations of these data? (25)

2. Describe the ecological fallacy (15 marks) and outline methods that epidemiologists use to draw more reliable inference from observational studies (10 marks).
3. Outline how one might initially assess the possible effects on the health of a population of a suspected environmental hazard (20 marks): illustrate your answer with a suitable example (5 marks).
4. Describe three important different types of bias that can affect case control studies (17 marks) and ways of minimising each of these (8 marks).

## ***SECTION B: Social Research Methods***

***Answer one question***

**Use a separate answer book**

5. You have been invited to undertake some action research in a local authority to consider the needs of adults with serious physical disabilities requiring accommodation and care twenty-four hours a day.

What is action research? (5 marks) What are its strengths and limitations in the context of the proposed research? (8 marks) Imagine the research is completed and you want to disseminate your findings - write the methods section for the article. (12 marks)

6. What is informed consent? (5 marks) Construct an 'information sheet' to be given to young adults participating in a study to evaluate a drug rehabilitation scheme. (20 marks)

## ***SECTION C: Demography***

***Answer one question***

**Use a separate answer book**

7. Name three sources of demographic information for a given population, explaining the strengths and weaknesses and giving examples as appropriate (25 marks).

8. What is meant by the dependency ratio? (5 marks) What assumptions underpin it? (5 marks) Explain how fertility and mortality rates affect dependency ratios in:

a) developed countries (5 marks)

b) developing countries (5 marks)

Give examples as appropriate (5 marks)