

BRIEF REPORT

Sex and coronary heart disease: the relative probability of dying in hospital

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We have recently undertaken a study of diabetic patients that examines the influence of sex on the probability of presenting with coronary heart disease (CHD) related events. This work has been presented in a preliminary form,¹ and contrasts with the findings of previous work.^{2,3}

The relation between sex and heart disease is complicated by other factors—for example, in 1993 Petticrew *et al* showed that women were being discriminated against since they were less likely than men to undergo cardiac surgery.⁴ Women also appeared to receive treatment such as thrombolysis less frequently than men.^{5,6} In preparing our analysis of diabetic patients for full publication, it was pointed out by an informal but independent reviewer that one of the assumptions underlying the work, and critical to its validity, was mistaken. The assumption we had made was that women and men had equal probability of

being admitted to hospital alive for treatment of cardiac events such as acute myocardial infarction, and therefore that both had equal probability of dying at home or outside hospital. Anecdotal reasons given for this possible source of bias include the hypothesis that general practitioners are less likely to identify chest pain in women as resulting from myocardial infarction (essentially discrimination), and that women themselves were less likely than men to identify cardiac symptoms.

Patients and methods

To test the hypothesis that women are more likely to die "at home" (meaning outside of hospital) from CHD related events, we obtained mortality data from the Office of Population Censuses and Surveys (OPCS) for the period 1993-95 for the South Glamorgan health authority (population 408 000). Details

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Number of deaths inside and outside of hospital for heart disease by age and gender in South Glamorgan over three years (1993 to 1995 inclusive)

	Age (years)						Total
	< 40	40-49	50-59	60-69	70-79	80+	
Male in hospital							
Acute myocardial infarction	2	20	55	109	184	108	478
Other forms of chronic ischaemic heart disease	2	13	31	98	123	72	339
Heart failure	8	5	23	47	121	102	306
Total	12	38	109	254	428	282	1123
Male out of hospital							
Acute myocardial infarction	2	7	26	86	118	71	310
Other forms of chronic ischaemic heart disease	1	9	24	87	108	82	311
Heart failure	0	1	4	17	41	41	104
Total	3	17	54	190	267	194	725
Female in hospital							
Acute myocardial infarction	2	2	10	49	112	161	336
Other forms of chronic ischaemic heart disease	2	1	10	23	51	99	186
Heart failure	6	4	14	43	92	211	370
Total	10	7	34	115	255	471	892
Female out of hospital							
Acute myocardial infarction	0	3	12	23	71	138	247
Other forms of chronic ischaemic heart disease	2	0	5	19	82	123	231
Heart failure	1	1	0	9	27	108	146
Total	3	4	17	51	180	369	624
Male population (× 1000)	119.2	25.0	19.4	19.1	11.7	4.1	198.5
Rate/1000/year	0.0	0.7	2.8	7.7	19.8	38.7	3.1
Female population (× 1000)	116.4	24.9	19.9	21.2	17.0	10.5	209.9
Rate/1000/year	0.0	0.1	0.9	2.6	8.5	26.7	2.4
Odds ratio of out of hospital to in hospital death in males v females							
Acute myocardial infarction	0.0	4.3	2.5	0.6	1.0	1.3	1.1
95% confidence interval	0.0-14.8	0.44-48.64	0.88-7.39	0.32-1.09	0.67-1.47	0.88-7.93	0.71-1.42
Other forms of chronic ischaemic heart disease	2.0	0.0	0.6	0.9	1.8	1.1	1.4
95% confidence interval	*	0.29-68	0.16-2.44	0.45-1.92	1.16-2.9	0.71-1.68	1.05-1.75
Heart failure	1.3	1.3	0.0	0.6	0.9	1.3	1.2
95% confidence interval	†	*	0.3-0.1	0.21-1.56	0.48-1.57	0.81-1.23	0.86-1.57
Total	1.2	1.3	1.0	0.6	1.1	1.1	1.1
95% confidence interval	0.14-10.09	0.27-5.84	0.04-2.07	0.4-0.88	0.88-1.46	0.9-1.44	0.94-1.25

Source, Office of Population Censuses and Surveys.

*Limits invalid.

†Undefinable.

of the cause of death (ICD9), sex, age, and the location of death were identified. These data were analysed to determine the relative likelihood (the odds ratio) of men and women dying at home or in hospital from acute myocardial infarction (ICD9 410), other forms of chronic ischaemic heart disease (ICD9 414), and heart failure (ICD9 428). The odds ratio is the ratio of the frequency of death at home in the male population to the total number of related male deaths minus this value, divided by the same calculation for the female population. If there is no difference in the experiences of the two groups, the resulting value will be 1.

Results

There were 15 345 deaths over the study period. Of these, 3364 (22%) had a primary cause of death in one of the three diagnostic categories, giving an average annual crude mortality rate of 2.7 per 1000 population per year. Men had consistently higher age specific mortality rates from CHD—for example, in the 80 years and older age group the mortality rates were 39 and 27 per 1000 population per year for males and females, respectively. After aggregation of the above diagnoses and age specific subgroups, there was a slight increase in the probability of men dying in hospital but this was not significant (odds ratio = 1.1, 95% confidence interval = 0.94 to 1.25). The disease and age and sex specific values are

shown in the table. Given the 49 significance tests in the table, two tests would be expected to be “significant” at the 5% level as a random finding.

Discussion

Although men and women differ in the probability of developing heart disease, they have virtually the same probability of dying at home (or outside hospital) from CHD—that is, they have the same probability of being hospitalised after a CHD event. If there is any discrimination within the system, it takes place after admission to hospital and is less likely to be an issue of variable referral practice from the community to hospital.

- 1 Hanna FWF, Currie CJ, Rees A, Peters JR. Gender difference in the relative risk of ischaemic heart disease in diabetes. *Diabetologia* 1996;**39**(Suppl 1):A194.
- 2 Barrett-Connor EL, Cohn BA, Wingard DL, Edelstein SL. Why is diabetes mellitus a stronger risk factor for fatal ischaemic heart disease in women than in men? The Rancho Bernardo Study. *JAMA* 1991;**265**:627–31.
- 3 Kannel WB. Lipids, diabetes and coronary heart disease: insights from the Framingham Study. *Am Heart J* 1985; **110**:1100–7.
- 4 Petticrew M, McKee M, Jones J. Coronary artery surgery: are women discriminated against? *BMJ* 1993;**306**: 1164–6.
- 5 Jha P, Deboer D, Sykora K, Naylor CD. Characteristics and mortality outcomes of thrombolysis trial participants and non-participants: a population based comparison. *J Am Coll Cardiol* 1996;**27**:1343–8.
- 6 Lincoff AM, Califf RM, Ellis SG, Sigmon KN, Lee KL, Leimberger JD, *et al*. Thrombolytic therapy for women with myocardial infarction: is there a gender gap? Thrombolysis and angioplasty in myocardial infarction study groups. *J Am Coll Cardiol* 1993;**22**:1780–7.