

# Fatal ischaemic heart disease in Belfast: a comparison of two community surveys

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## SUMMARY

*Data from two community surveys in Belfast were used to compare all deaths attributed to ischaemic heart disease during two one-year periods (1965/66 and 1981/82). There was an increase in mortality in men of all ages from 3.3 to 4.4 per 1,000 population (33%) and in women from 1.6 to 3.1 per 1,000 population (94%). Only in men aged less than 70 years was the mortality rate unchanged (2.2 per 1,000 population). The proportion of deaths in persons whose fatal attack began outside the hospital was virtually unchanged (65% in 1965/66 compared with 69% in 1981/82). Survival time was markedly decreased in the later survey, as were delay times in initiating medical care. The increase in mortality probably is due to an increase in the incidence of acute myocardial infarction. The introduction of mobile coronary care in Belfast in 1965 seems to have had equal effects in reducing mortality inside and outside hospital.*

## INTRODUCTION

McNeilly and Pemberton carried out a survey of all deaths due to ischaemic heart disease (IHD) in 1965/66 in Belfast.<sup>1, 2</sup> A similar survey conducted in 1981/82 allows some comparisons to be made after an interval of 16 years,<sup>3</sup> during which mobile (pre-hospital) coronary care was established.<sup>4, 5</sup> The accuracy of death certification and data relating to the fatal attack and possible medical intervention in relation to the 1981/82 study have been described elsewhere.<sup>6, 7</sup> In the present communication, as well as ascertaining accurate community mortality rates, we consider place of death, delay in instituting medical care, survival time and any previous myocardial infarction as factors which may have been influenced by the introduction of mobile coronary care.

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## MATERIALS AND METHODS

### *Population studied.*

There are two coronary care units in Belfast, sited at the Belfast City Hospital and at the Royal Victoria Hospital. A mobile coronary care unit was introduced at the Royal Victoria Hospital on 1 January 1966. Only three deaths in 1965/66 occurred in persons transported by the mobile coronary care unit. The population of Belfast studied in 1965/66 was based on the 1961 Census, and that of the 1981/82 study on the 1981 Census. In 1981/82 the adjacent district of Castlereagh (population 60,757) was included in the study population. This is served by the Ulster Hospital which has a mobile coronary care unit<sup>5</sup> and medical care is similar to that in Belfast.

During the twenty-year interval between the two studies there was a major fall in the population of the city of Belfast, due to demographic factors. The study population in 1965/66 was 415,856 persons and in 1981/82 was 355,980 (14% lower). The population aged less than 70 years was 390,286 persons in 1965/66, and 321,647 persons in 1981/82 (18% lower).

### *Ascertainment of deaths.*

The main source of ascertainment of deaths in both studies was death certification. In 1965/66 only deaths coded under the International Classification of Diseases (ICD), 7th revision, 1955, numbers 420.0 (arteriosclerotic heart disease) and 420.1 (heart disease specified as involving the coronary arteries) were included. A small number of deaths under ICD 420.2 (angina pectoris) were excluded and no deaths classified under other ICD numbers were included. Of the 1,017 deaths provisionally included, eight subsequently were excluded as a post-mortem examination had not confirmed ischaemic heart disease as the cause of death, and another 11 were excluded on clinical grounds which indicated other causes of death. A total of 19 deaths (1.9%) was excluded, leaving 998 for study. In 1981/82, all deaths coded under ischaemic heart disease (ICD nos 410-414, 9th revision, 1979) were provisionally included. However, all other deaths thought possibly or probably to be due to ischaemic heart disease were provisionally included irrespective of ICD coding. These were identified as in the earlier study by a research worker (R H McN in 1965/66, M D I D in 1981/82) checking through each death certificate at the General Register Office on a weekly basis, usually about three weeks after the death was registered, and selecting those possibly due to IHD. A questionnaire was then filled in for each death. Some 143 deaths not coded under ICD nos 410-414 were included. This group has no equivalent in the earlier survey. There were 108 deaths (9%) coded under ischaemic heart disease which were excluded on clinical grounds by a panel of cardiologists, as there were strong competing causes of death. This is a higher proportion than in 1965/66 and assessment was more rigorous in the later survey.

### *Information sources and analysis.*

The main sources of information — hospital notes, general practitioners, ambulance records, post-mortem records and home interviews with deceased persons' relatives — were similar, but disproportionately more interviews were carried out in 1981/82 (775) than in 1965/66 (approximately 200). The questionnaires were coded and stored on computer and the original coded punch cards from the 1965/66 study were entered into the computer since the original questionnaires for that study contained only coded information.

## RESULTS

*Mortality from ischaemic heart disease.*

Table I shows deaths from this cause in 1965/66 and 1981/82 by age and sex. There were 33% more deaths in 1981/82 compared with 1965/66. In men aged less than 70 years there were 16% fewer deaths (351 as opposed to 420), but in women there were 10% more (145 as opposed to 132). The proportion of deaths in those aged less than 70 years decreased from 55% (552 out of 998) to 37% (496 out of 1,323).

TABLE I

*Deaths from ischaemic heart disease in 1965/66 and 1981/82 by age and sex*

Age	Males		Females		Total	
	1965/66	1981/82	1965/66	1981/82	1965/66	1981/82
<70 yrs	420 (65%)	351 (48%)	132 (37%)	145 (25%)	552 (55%)	496 (37%)
≥70 yrs	224 (35%)	384 (52%)	222 (63%)	443 (75%)	446 (45%)	827 (63%)
TOTAL	644	735	354	588	998	1323

The age/sex specific mortality rates per 1000 population are shown in Table II. The overall mortality in men rose from 3.3 in 1965/66 to 4.4 in 1981/82 (33%). In women the mortality rate rose from 1.6 to 3.1 (94%). For age less than 70 years the mortality rate was unchanged in men (2.2) but increased in women from 0.6 to 0.9 (34%). For age 70 years and above the mortality rate increased in men from 24.4 to 33.4 (37%) and in women from 13.5 to 19.4 (44%). There was a decline in mortality in men aged less than 45 years, no important change from 45–59 years, a small decline from 60–69 years and a marked increase in men above 70 years. In women there was a small decline in those aged less than 45 years, with an increase in all other age groups, especially those above 70 years.

TABLE II

*Age/sex specific mortality rates per 1000 population from ischaemic heart disease, in 1965/66 and 1981/82*

Age	Males		Females		Total	
	1965/66	1981/82	1965/66	1981/82	1965/66	1981/82
<35	0.1	0	0.1	0	0.1	0
35–39	0.6	0.4	0	0	0.3	0.2
40–44	1.8	0.7	0.5	0.2	1.1	0.4
45–49	2.7	2.6	0.3	0.4	1.4	1.4
50–54	4.2	4.3	0.7	1.3	2.3	2.7
55–59	6.6	6.9	1.6	2.2	3.9	4.3
60–64	11.3	10.7	2.7	3.5	6.4	6.7
65–69	18.9	14.3	5.8	5.7	11.1	9.4
TOTAL <70	2.2	2.2	0.65	0.87	1.4	1.5
70–74	19.4	26.1	9.3	10.3	13.0	16.3
75–79	27.7	31.8	17.1	18.1	20.9	22.7
80–84	31.8	41.9	16.6	27.0	21.9	31.2
85–89	25.6	71.9	20.0	35.2	21.8	44.1
90–94	40.8	87.6	7.7	58.1	16.7	63.4
95+	0	83.3	20	52.6	15.9	56.8
TOTAL ≥70	24.4	33.4	13.5	19.4	17.4	24.1
TOTAL	3.3	4.4	1.6	3.1	2.4	3.7

*Place of death.*

In 1965/66, 59% of all deaths occurred outside hospital. This was very similar to the proportion among the 1,277 deaths occurring inside the study boundary in 1981/82 (57%). Fifty deaths occurred outside the study boundary and would not have been within range of the cardiac services under consideration. The proportion of persons whose onset of the fatal attack occurred inside hospital increased from 7% (37) to 12% (57) in those aged less than 70 years and from 13% (60) to 16% (158) in those aged 70 years and above. The proportion of deaths at all ages outside hospital in cases in which the onset of the attack also occurred outside hospital rose slightly from 65% (589 of 901 deaths) in 1965/66 to 69% (731 of 1,062 deaths) in 1981/82. In those aged less than 70 years the proportions were 66% (342 of 515) and 70% (292 of 416) respectively.

TABLE III

*Median survival times and delay times in 1965/66 and 1981/82 by age*

< 70 years		≥ 70 years		All ages		Number of cases	
1965/66	1981/82	1965/66	1981/82	1965/66	1981/82	1965/66	1981/82
Survival time — minutes							
135	65	270	121	165	84	815	715
Onset to call for first medical aid — minutes							
60	10	60	8	60	8	581	457
Onset to call for ordinary ambulance — minutes							
235	7	342	21	278	11	234	252
Onset to call for mobile coronary care unit — minutes							
—	15	—	15	—	15	—	170
Onset to ward care or to mobile coronary care in 1981/82 — minutes							
360	90	642	195	425	138	259	207

*Survival time.*

In 1981/82 an upper limit of 28 days' survival time was defined,<sup>8</sup> so that 56 persons surviving for more than 28 days in 1965/66 have been excluded from our analysis (Table III). Cases with times known less accurately than  $\pm 5\%$  have been excluded in 1981/82 (145 deaths), along with those considered to have no specific time of onset to their fatal attack (152), and all unwitnessed deaths (265). For 1965/66, estimated survival times are included and only 127 deaths were excluded. Survival time was much shorter in 1981/82: median survival time decreased from 165 minutes in 1965/66 to 84 minutes in 1981/82. The proportion of very sudden deaths (within four minutes) increased from 5% (43 of 815) in 1965/66 to 19% (140 of 715) in 1981/82.

*Delay times in initiating medical care.*

Median delay times from the onset of the fatal attack to calling for first medical aid, the ordinary ambulance or mobile coronary care unit in 1981/82 and to arrival in the hospital ward (or arrival of MCCU to a live patient) are compared (Table III). In 1965/66 there were 127 persons with unknown survival times and 56 persons with survival times  $> 28$  days who were excluded, and in 1981/82 data known less accurately than  $\pm 5\%$  were excluded. The delay times are much reduced in 1981/82, so that, in persons aged less than 70 years, 29% (44 of 153 persons) came under care in 1965/66 after 12 hours compared with only 12% (13 of 105 persons) in 1981/82. In those aged more than 70 years, these proportions were 48% (51 of 106) and only 18% (18 of 102) respectively.

TABLE IV

*Number of previous myocardial infarctions, number of persons and ratio of number of previous myocardial infarctions to the number of persons dying from ischaemic heart disease, in Belfast in 1965/66 and in 1981/82, in persons aged less than 70 years*

Age group	1965/66			1981/82		
	Previous MI	Persons	Ratio	Previous MI	Persons	Ratio
<35 years	0	3	0	0	0	0
35-39	3	7	0.43	2	4	0.5
40-44	5	27	0.19	6	8	0.75
45-49	20	37	0.54	8	28	0.29
50-54	34	61	0.56	26	57	0.46
55-59	60	93	0.65	46	95	0.48
60-64	69	138	0.5	57	13	0.44
65-69	84	181	0.46	74	171	0.43
Total	218	416	0.5	219	494	0.44

#### *Previous myocardial infarction.*

In 1965/66 and 1981/82 the number of previous episodes of myocardial infarction was recorded for each person. Confirmation by electrocardiograph was available in 94% of these episodes in 1981/82; in 1965/66 the proportion was probably less. The ratio of previous infarctions per person by five-year age groups up to 70 years of age is shown in Table IV. This ratio is higher in 1965/66 in all age groups except those aged less than 45 years.

#### DISCUSSION

The 16-year period from 1965/66 to 1981/82 has seen significant changes in the epidemiology of fatal ischaemic heart disease in Belfast. The differences in methodology in the two survey periods probably does not affect the overall conclusions. The mean age at death increased by four years in both sexes. The periodic ICD revisions exert a small bias due to the re-allocation of certain causes of death. In men aged less than 70 years the mortality rate was unchanged, but mortality increased in older men by 37%. In women, mortality increased by 34% in those aged less than 70 years and 44% in those aged 70 years or over. As delay times from the onset of the fatal attack to providing medical care were substantially shortened, the increase in the community mortality rates is most likely due to a large rise in the incidence of acute myocardial infarction rather than to changes in the survival rates. The effects of mobile coronary care can only be studied indirectly. We may postulate that such care might prolong survival time while the survival rate after the acute attack remains unchanged, or it might solely reduce mortality outside hospital. However, Adgey et al (1971) showed a reduction of in-hospital mortality from acute myocardial infarction in patients seen early (within three hours of onset of symptoms).<sup>9</sup> Thompson et al (1979) also showed a reduction of in-hospital mortality with cardiopulmonary resuscitation performed outside hospital.<sup>10</sup> The shortening of survival time, together with the unchanged proportion of deaths occurring outside hospital may be due to equal reductions in fatality rates of acute myocardial infarction occurring inside

or outside hospital. The data do not support the view that more persons are surviving a first episode of acute myocardial infarction, but the criteria used to establish previous episodes in the 1965/66 study could not be adequately assessed.

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