Blood group and socio-economic class

A report last year, based on a study of a British population, that A blood groups are significantly more common among members of the higher socio-economic groups (classes I and II) has generated a wealth of correspondence, some of which appears in what follows together with a reply from the original authors. The general conclusion seems to be that there can be no general conclusion.

BEARDMORE and Karimi-Booshehri[1] recently reported an association between ABO blood group phenotype and social class. They found that in both sexes the A phenotype was significantly more frequent and the O phenotype significantly less frequent in social classes I and II, the converse being true for social classes III, IV and V. In an attempt to replicate Beardmore and Karimi-Booshehri's findings we have analysed data obtained by the National Child Development Study (NCDS)[2].

The NCDS study commenced as the Perinatal Mortality Survey and involved all children born in Britain during the week 3–9 March 1958. At that time detailed obstetric data were obtained on each child[3,4]. In addition the mothers blood type (ABO and Rh status), her occupational status at commencement of pregnancy, and the occupational status of her father and of her husband were noted. The standard geographical region in which she lived and in which she was born were also recorded.

The occupational status of a married woman can be classified in several ways: (1) by her own socio-economic group (although this necessarily excludes a large number of women who are housewives); (2) on the basis of her father's occupation (when she left school); (3) on the basis of her husband's occupation (in 1958). We have used all three classifications in analysing the relationship between ABO blood group phenotype and social class.

Table 1 presents the breakdown of ABO blood group phenotype by social class and by migrational status. Natives were defined as those born and still living in the same region; all other individuals were classified as migrants. The regions were defined as the 11 standard regions of Britain[5].

For all three classifications of social class we found no evidence to support the notion of either heterogeneity between migrants and natives ABO phenotypic distributions (see Table 1) or an excess of the A phenotype in social classes I and II.

There are several possible reasons for our failure to replicate Beardmore and Karimi-Booshehri's results:

Table 1 Percentages of ABO blood group phenotypes by social class (three classifications) in natives and migrants in Britain

Classification		Blood group	I II	III	IV	V	Total No.	Total %
Mother's own	Migrant	A	41.7	39.4	44.4	50.0	327	41.6
		O	50.0	49.8	43.7	42.9	379	48.2
		B	7.6	6.9	9.3	5.4	58	7.4
		AB	0.7	3.9	2.6	1.8	23	2.9
		Total no.	144	436	151	56	787	
	Native	A	40.8	42.3	41.5	47.6	1,329	42.2
		O	47.8	46.6	48.6	44.7	1,479	47.1
		B	8.0	8.5	8.2	5.8	257	8.2
		AB	3.3	2.7	1.7	1.9	77	2.5
		Total no.	299	1,832	805	206	3,142	

χ^2 testing: ABO by social class (migrant) $\chi^2(9) = 8.359$ $P = 0.498$
ABO by social class (native) $\chi^2(9) = 7.226$ $P = 0.614$
ABO by migrational status $\chi^2(3) = 1.306$ $P = 0.728$
Migrational status by social class $\chi^2(3) = 54.963$ $P < 0.001$

			I	II	III	IV	V	Total No.	Total %
Father's social class	Migrant	A	36.2	38.8	41.5	41.7	45.7	718	41.1
		O	59.4	53.0	46.0	47.4	42.6	835	47.9
		B	0.0	4.7	8.7	7.8	7.8	129	7.4
		AB	4.3	3.5	3.7	3.2	3.9	63	3.6
		Total no.	69	317	882	348	129	1,745	
	Native	A	40.4	40.9	41.2	43.6	41.7	2,538	41.8
		O	47.5	47.4	47.5	45.4	45.0	2,836	46.7
		B	10.1	8.5	8.4	8.2	10.3	521	8.6
		AB	2.0	3.2	2.9	2.8	3.0	176	2.9
		Total no.	99	709	3,054	1,585	624	6,071	

χ^2 testing: ABO by social class (migrant) $\chi^2(12) = 17.320$ $P = 0.138$
ABOby social class (native) $\chi^2(12) = 6.551$ $P = 0.886$
ABO by migrational status $\chi^2(12) = 5.062$ $P = 0.167$
Migrational status by social class $\chi^2(4) = 110.064$ $P < 0.001$

			I	II	III	IV	V	Total No.	Total %
Husband's social class	Migrant	A	37.8	42.2	40.9	45.4	41.2	805	41.4
		O	51.9	46.8	46.4	45.4	43.8	910	46.9
		B	8.9	8.7	9.3	6.9	12.5	173	8.9
		AB	1.4	2.3	3.4	2.3	2.5	54	2.8
		Total no.	214	393	993	262	80	1,942	
	Native	A	43.4	43.4	41.4	40.8	39.2	2,855	41.5
		O	48.4	45.4	46.8	48.6	48.6	3,243	47.1
		B	5.5	7.2	8.9	8.1	8.7	576	8.4
		AB	2.7	4.0	3.0	2.5	3.5	209	3.0
		Total no.	256	917	3,991	1,293	426	6,883	

χ^2 testing: ABO by social class (migrant) $\chi^2(12) = 9.350$ $P = 0.673$
ABO by social class (native) $\chi^2(12) = 13.629$ $P = 0.325$
ABO by migrational status $\chi^2(3) = 0.874$ $P = 0.832$
Migrational status by social class $\chi^2(4) = 248.342$ $P < 0.001$

Values in parentheses are d.f.

(1) We have looked only at women, whereas Beardmore and Karimi-Booshehri considered both sexes. Nevertheless it is clear from their analysis that their effect is found in both sexes to the same degree. We have attempted to repeat their study by considering both natives and migrants. If this restriction is removed, the sample available for analysis increases, but there still remains no association between ABO blood group status and social class.

(2) The NCDS is a sample of the breeding population of Britain whereas the blood donor data will also include non-breeders. However, it is more likely that the sampling procedure used by the NCDS generates a truly random sample, whereas it is not inconceivable that blood donor data could be biased.

(3) Some evidence of nonrandomness in the blood donor data can be obtained from analysis of the social class distributions. Comparison of each data set with the Registrar General's social class distributions indicates that the NCDS data do not differ markedly from expectation whereas the donor data reveal a significant excess of people in social classes II and V (about 5% and 12% respectively) and relative deficiency of 21% in social class III. There is also marked heterogeneity between NCDS and blood donor samples, for example, using the husband's occupation $\chi^2 = 1{,}746.855$, $P < 0.0001$ (d.f. = 6). Restricting the comparisons to the Registrar-General's standard regions of East and West Riding and south-west England does not affect the above conclusions.

We also note that Beardmore and Karimi-Booshehri found an association only between ABO phenotype and social class and not between migrational status and ABO phenotype, despite a clear association between migrational status and social class.

(4) The ABO phenotype frequencies differ between samples. This is to be expected since we have analysed data from Britain as a whole rather than two geographical regions. However, if we restrict our analysis to the two Registrar-General standard regions mentioned above there is no heterogeneity in ABO phenotypes between samples. Even with this reduced sample we can find no evidence to support Beardmore and Karimi-Booshehri's results.

We have also examined the relationship between social mobility and ABO phenotype, classifying mothers on the basis of her own and her father's social class, as either upwardly mobile, downwardly mobile or non-mobile. Again there was no evidence that this intergenerational social mobility was related to ABO phenotype ($\chi^2 = 1.457$, $P = 0.962$, d.f. = 6).

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IN a recent article[1], Beardmore and Karimi-Booshehri showed that among 10,000 blood donors from south-west England and Yorkshire there were marked differences in the ABO blood group distribution with social class. Th[illegible] study by Mascie-Taylor and McMan[illegible] shows an analysis of women who ga[illegible] birth in the 1 week's national birth surv[illegible] in 1958. Here we analyse data from [illegible] subsequent birth survey. The data rela[illegible] to 14,384 women resident in Great Brita[illegible] and who gave birth in the week 5-11 Ap[illegible] 1970. The data were collected in the Bri[illegible]ish Births survey[2,3] sponsored by th[illegible] National Birthday Trust Fund. Well ove[illegible] 95% of all births in England, Scotlan[illegible] Wales and Northern Ireland we[illegible] included.

The ABO blood groups of thes[illegible] mothers were compared with their socia[illegible] class, based on the occupation of the hus[illegible]bands, using the Registrar General'[illegible] Classification of Occupations[4]. Unmarrie[illegible] mothers and those whose husbands' occu[illegible]pations were unclear were omitted (n = 415). Ths distribution of ABO bloo[illegible] groups using this classification is shown i[illegible] Table 2. As shown for the 1958 survey there was no significant differenc[illegible] between the social classes.

This classification uses the husband'[illegible] occupation. We did not use that of th[illegible] woman herself since married pregnan[illegible] women are often housewives or are onl[illegible] in part-time employment. Information was available, however, concerning the

Table 2 Distribution of ABO blood groups of mothers delivering during 5-11 April 1970 b[illegible] social class (based on husband's occupation)

Blood group of mother	Social class I	II	III	IV	V	All known
O	368 (48.0%)	822 (47.0%)	4,110 (47.6%)	1,099 (49.2%)	484 (49.0%)	6,883 (47.8%)
A	300 (39.1%)	727 (41.4%)	3,482 (40.3%)	833 37.3%)	373 (37.7%)	5,715 (39.7%)
B	73 (9.5%)	160 (9.1%)	792 (9.2%)	231 (10.3%)	108 (10.9%)	1,364 (9.5%)
AB	26 (3.4%)	45 (2.5%)	258 (2.9%)	70 (3.2%)	23 (2.4%)	422 (3.0%)
All known	767 (100.0%)	1,754 (100.0%)	8,642 (100.0%)	2,233 (100.0%)	988 (100.0%)	14,384 (100.0%)

$\chi^2 = 16.1$, d.f = 12, not significant.

Table 3 ABO blood groups according to highest educational qualification of mothers

Highest educational qualification	Blood group O	A	B	AB	All known
None	2,884 (46.9%)	2,510 (40.8%)	574 (9.4%)	180 2.9%)	6,148 (100.0%)
Vocational	778 (49.0%)	623 (39.2%)	142 (9.0%)	45 (2.8%)	1,588 (100.0%)
O-level or equivalent	932 (47.3%)	816 (41.5%)	162 (8.2%)	59 (3.0%)	1,969 (100.0%)
A-level or equivalent	186 (47.2%)	154 (39.1%)	47 (11.9%)	7 (1.8%)	394 (100.0%)
SRN or Certificate of Education	272 (49.6%)	211 (38.4%)	52 (9.4%)	14 (2.6%)	549 (100.0%)
University or college degree or other higher	181 (44.8%)	173 (42.8%)	40 (9.9%)	10 (2.5%)	404 (100.0%)
All known	5,233 (47.3%)	4,487 (40.6%)	1,017 (9.2%)	315 (2.9%)	11,052 (100.0%)

$\chi^2 = 12.7$, d.f = 15, not significant.