LETTERS TO THE EDITOR

Sex ratio at birth and latitude

Editor,—Grech *et al*[1] report that sex ratio (proportion male) at birth declines highly significantly with increase in geographical latitude in Europe. They wonder if this is an effect of temperature variation. This may be so, but I suggest that variations in maternal hormone levels are a proximate cause. The reason for suggesting this is as follows.

I have reported highly significant correlations between latitude and (a) birth weight and (b) maternal age standardised dizygotic (DZ) twinning rates across the countries of Europe and the states of the United States. Birth weight and DZ twinning rates are both higher at more extreme latitudes.[2]

There is direct[3] and indirect[4] evidence that maternal oestrogen levels correlate with the birth weights of their infants. Moreover maternal oestrogen levels reportedly correlate with the probability of bearing a pair of DZ twins.[5] Lastly, there is good evidence that maternal hormone (including oestrogen) levels at the time of conception partially control the sexes of offspring.[6] Bearing in mind Occam's Razor, it is tempting to propose that one cause (variation in maternal hormone levels) is at least partially responsible for all three effects—including the variation of sex ratio with latitude.

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1 Grech V, Vassallo-Agius P, Savona-Ventura C. Declining male births with increasing geographical latitude in Europe. *J Epidemiol Community Health* 2000;**54**:244–6.
2 James WH. Dizygotic twinning, birth weight and latitude. *Ann Hum Biol* 1985;**12**:441–7.
3 Gerhard I, Fitzer C, Klinga K, *et al*. Oestrogen screening in evaluation of foetal outcome. *J Perinat Med* 1986;**14**:279–91.
4 Xu B, Jarvelin M-R, Lu H, *et al*. Maternal determinants of birth weight : a population based sample from Qingdao, China. *Soc Biol* 1995;**42**: 175–84.
5 Martin NG, de Kretser DM, Robertson DM, *et al*. Elevation of follicular phase inhibin and LH levels in mothers of dizygotic twins suggests nonovarian control of human multiple ovulation. *Fertil Steril* 1991;**56**:469–74.
6 James WH. Evidence that mammalian sex ratios at birth are partially controlled by parental hormone levels at the time of conception. *J Theor Biol* 1996;**180**:271–86.

Author's reply

Editor,—Dr James may well be correct in that maternal oestrogen levels during pregnancy may play a part in determining the sex of offspring. Such external influences could be multiple, and include not only temperature variations and maternal hormone levels, but also other, as yet unsuspected factors.

An interesting study would be the analysis of seasonal variations of sex ratios at birth, for individual countries. A latitude effect would thus be excluded, and any variations in the birth sex ratio would be more likely to be caused by a temperature variation effect.

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CORRECTIONS

An authors' error occurred in the paper by Evans and others (2000;**54**:677–86). Because of a computing error, missing data were not excluded from some of the analyses in this paper, resulting in minor inaccuracies to table 4. This in no way changes the conclusions of the paper. A "corrected" table 4, together with minor textual revisions can be obtained from the authors.

An authors' error appeared in the paper of Dr Engström and others (2000;**54**:104–7). In table 3, the number of never smokers without cardiac events should be 4137 (instead of 4537). Some percentages were not correctly rounded. Of the women who suffered cardiac events, 33 (32%) (instead of 33 (31%)) were single, 13 (12%) (instead of 13 (13%)) had diabetes, 3 (3.4%) (instead of 3 (2.4%)) had college/university education. The number of individuals with missing information was in part given in the methods and in part in the table, which caused some confusion. The numbers in the tables and the methods are, with exception of the never smokers, correct.

An error occurred in this paper by Dr Watt and others (2000;**54**:827–33). The spacing within table 1 was incorrect. A version of the table with the correct format is shown here.

Table 1 Mean (SD) of the five fatigue scales in the total population and in sociodemographic groupings. The range of the scales are 0 to 100. Higher scores indicate more fatigue

	General Fatigue	*Physical Fatigue*	*Reduced Activity*	*Reduced Motivation*	*Mental Fatigue*
All (n=1082)	35 (28)	33 (27)	26 (27)	18 (19)	24 (24)
Women (n=544)	37 (30)	34 (28)	25 (27)	16 (19)	23 (25)
Men (n=533)	33 (26)	32 (26)	27 (26)	20 (19)	24 (23)
Age 20–29 (n=175)	34 (25)	28 (23)	21 (20)	13 (13)	24 (23)
Age 30–39 (n=207)	33 (23)	28 (22)	18 (20)	15 (15)	22 (22)
Age 40–49 (n=183)	35 (28)	31 (27)	21 (24)	18 (19)	25 (23)
Age 50–59 (n=185)	37 (28)	34 (27)	27 (25)	18 (18)	25 (24)
Age 60–69 (n=181)	32 (29)	35 (29)	31 (28)	19 (21)	20 (23)
Age 70–79 (n=151)	39 (34)	44 (34)	42 (35)	25 (24)	26 (29)
Social class I (n=134)	32 (25)	31 (24)	22 (24)	16 (17)	19 (21)
Social class II (n=208)	29 (24)	28 (25)	19 (21)	14 (16)	19 (20)
Social class III (n=232)	36 (29)	34 (28)	26 (27)	19 (19)	24 (24)
Social class VI (n=269)	35 (28)	31 (27)	26 (26)	18 (19)	25 (24)
Social class V (n=148)	42 (32)	40 (30)	35 (30)	22 (23)	28 (27)
>3 years education (n=246)	32 (25)	31 (25)	22 (24)	16 (19)	20 (22)
Apprenticeship (n=231)	32 (27)	28 (25)	23 (24)	16 (16)	22 (25)
<3 years education (n=292)	35 (28)	32 (27)	25 (25)	17 (18)	24 (22)
No education (n=199)	43 (31)	43 (31)	38 (32)	25 (23)	28 (28)
Cohabiting (n=778)	34 (27)	32 (26)	24 (25)	17 (18)	22 (23)
Living alone (n=296)	37 (29)	35 (29)	31 (29)	19 (21)	27 (26)