

sent memorandums pointing out any errors and omissions every six months.

In 1996-7, the failure rate for bodies from all sources was 10.2% (table). This figure fell in the study period to 2.9% in 1999-2000. The bodies received from the hospital accounted for most cases of failed documentation. When the failure rate was calculated for hospital deaths alone, it fell from 11.9% in 1996-7 to 4.0% in 1999-2000.

Comment

That the documentation of about 10% of deceased patients contained errors at the beginning of the study suggests that clinical staff were paying insufficient attention to the identification and details of deceased patients. Although some of the discrepancies were arguably less important, such as errors in unit number or address, a substantial proportion could have had serious consequences. These include misidentification of the body (body received in the mortuary with the wrong name) or property and non-notification of pacemakers.

Pathology is one of the most intensely scrutinised medical specialties. Clinical Pathology Accreditation (UK) sets standards for medical laboratories and mortuaries and insists on external quality control measures and regular internal audits. However, the mandatory quality assurance procedures refer only to the internal

quality control of all examinations and do not specifically refer to mortuary services.⁴ Our experience of inspections by Clinical Pathology Accreditation is that little emphasis is put on regular internal quality control audit of the mortuary or on any other internal quality assurance procedures. The error rate fell during our study, probably because staff were regularly alerted to errors as part of the audit. We therefore believe that such audits are essential for a mortuary to run effectively and safely and to gain public confidence.

We thank Colin Humphries and Rachel Jones for collecting routine data and Tony Board for suggesting a regular mortuary audit. We also thank Angela Turner for typing the manuscript.

Contributors: PS was responsible for initiating and coordinating the audit and data analysis. YLH was responsible for reviewing the literature, interpreting the results, and writing and editing the paper. EL was responsible for statistical analysis and also helped edit the paper. YLH is the guarantor.

Funding: None.

Competing interests: None declared.

- 1 Lawrence J. Milburn blames hospitals manager for allowing corpses to be left on chapel floor. *Independent* 2001 Jan 17. www.independent.co.uk/story.jsp?story=51331 (accessed 8 Jan 2002).
- 2 Carvel J, Branigan T. Hospital admits storing 12 bodies in boilerhouse. *Guardian* 2001 Jan 19. www.guardian.co.uk/Archive/Article/0,4273,4119764,00.html (accessed 8 Jan 2002).
- 3 Hunter M. Alder Hey report condemns doctors, management, and coroner. *BMJ* 2001;322:255.
- 4 Clinical Pathology Accreditation (UK) Ltd. Standards for the medical laboratory. www.cpa-uk.co.uk (accessed 27 Mar 2001).

(Accepted 22 October 2001)

RESEARCH POINTERS

Unexplained differences in sex ratios at birth in Europe and North America

The male:female ratio at birth by latitude in Europe is the reverse of that in North America. A temperature related effect cannot account for this

In mammals, male live births exceed female ones. In humans, the ratio of male births to total births is expected to be 0.515. In Europe during 1990-5 this differed significantly with increasing geographical latitude.¹ We analysed and compared the male to female ratio in Europe and North America over 50 years.

Methods and results

We obtained annual data on male and female live births from the World Health Organization (WHO) for the North American continent for 1958-97 and for European countries for 1950-99. Overall < 3% of data were missing.

European countries were banded by latitude. Southern countries (latitude 35-40°) included Bulgaria, Greece, Italy, Malta, Portugal, and Spain. Central Europe (40-55°) included Austria, Belgium, Czech Republic, France, Germany, Hungary, Ireland, Luxembourg, Netherlands, Poland, Romania, Switzerland, and the United Kingdom. Nordic countries (> 55°) include Denmark, Finland, Iceland, Norway, and Sweden. North America was divided by latitude into Canada (> 50°), the United States (30-50°), and Mexico (< 30°).

We analysed contingency tables using χ^2 and χ^2 for trend and obtained 95% confidence intervals for ratios by using the Fleiss equations. $P \leq 0.05$ was taken as significant.

Results

Significantly more boys were born in southern countries (table) than in central Europe ($\chi^2=57$, $P < 0.0001$) or the Nordic countries ($\chi^2=8.8$, $P=0.003$; χ^2 for trend=120, $P < 0.0001$). The difference between central Europe and the Nordic countries was not significant. All had a male to female ratio < 0.515, with a resultant male birth deficit of 12 744 in the Mediterranean, 212 780 in central Europe, and 13 169 in the Nordic countries (total deficit of male births 238 693).

A low male to female ratio was found in Mexico, a higher ratio in the United States, and an even higher ratio in Canada (χ^2 for trend=57, $P < 0.0001$). All had a male to female ratio < 0.515, with a resultant male birth deficit of 21 993 in Canada, 410 932 in the United States, and 521 789 in Mexico (total deficit 954 714).

Paediatric Department, St Luke's Hospital, Guardamangia MSD 09, Malta
Victor Grech
consultant

continued over

BMJ 2002;324:1010-1

Numbers of male, female, and total births, with calculated male:female ratios for countries included in study of sex ratios at birth in Europe and North America

Region/country	Live births			Male:female ratio (95% CI)
	Male	Female	Total	
Nordic countries (>55°):	7 579 510	7 163 556	14 743 066	0.5141 (0.5139 to 0.5144)
Denmark	1 680 922	1 652 473	3 394 155	0.5141 (0.5136 to 0.5147)
Finland	1 741 682	1 652 473	3 394 155	0.5131 (0.5126 to 0.5137)
Iceland	104 747	98 862	203 609	0.5145 (0.5123 to 0.5166)
Norway	1 444 600	1 363 935	2 808 535	0.5144 (0.5138 to 0.5149)
Sweden	2 607 559	2 459 796	5 067 355	0.5146 (0.5141 to 0.5150)
Southern countries (35-40°):	43 290 341	40 793 319	84 083 660	0.5148 (0.5147 to 0.5150)
Bulgaria	3 176 760	3 000 118	6 176 878	0.5143 (0.5139 to 0.5147)
Greece	3 395 944	3 168 572	6 564 516	0.5173 (0.5169 to 0.5177)
Malta	162 065	151 445	313 510	0.5169 (0.5152 to 0.5187)
Portugal	4 283 717	4 015 694	8 299 411	0.5161 (0.5158 to 0.5165)
Italy	18 671 513	17 652 250	36 323 763	0.5140 (0.5139 to 0.5142)
Spain	13 600 342	12 805 240	26 405 582	0.5151 (0.5149 to 0.5152)
Central Europe (40-55°):	108 325 130	102 428 093	210 753 223	0.5140 (0.5139 to 0.5141)
Austria	2 600 186	2 466 512	5 066 698	0.5132 (0.5128 to 0.5136)
Belgium	3 138 073	2 965 932	6 104 005	0.5141 (0.5137 to 0.5145)
Czech Republic	817 297	774 436	1 591 733	0.5135 (0.5127 to 0.5142)
France	19 579 581	18 634 567	38 214 148	0.5124 (0.5122 to 0.5125)
Hungary	3 815 036	3 587 994	7 403 030	0.5153 (0.5150 to 0.5157)
Ireland	1 498 481	1 416 062	2 914 543	0.5141 (0.5136 to 0.5147)
Luxembourg	114 859	108 397	223 256	0.5145 (0.5124 to 0.5165)
Netherlands	5 160 590	4 899 973	10 060 563	0.5130 (0.5126 to 0.5133)
Poland	15 295 234	14 359 427	29 654 661	0.5158 (0.5156 to 0.5160)
Romania	8 082 232	7 649 545	15 731 777	0.5138 (0.5135 to 0.5140)
Switzerland	2 103 563	1 995 775	4 099 338	0.5131 (0.5127 to 0.5136)
United Kingdom	20 441 737	19 330 020	39 771 757	0.5140 (0.5138 to 0.5141)
Germany	25 678 261	24 239 453	49 917 714	0.5144 (0.5143 to 0.5146)
Central Europe and Mediterranean (35-55°)	151 615 471	143 221 412	294 836 883	0.5142 (0.5142 to 0.5143)
All Europe	159 194 981	150 384 968	309 579 949	0.5142 (0.5142 to 0.5143)
North America:	127 034 732	121 488 464	248 523 196	0.5112 (0.5111 to 0.5112)
United States (30-50°)	76 827 922	73 150 435	149 978 357	0.5123 (0.5122 to 0.5123)
Mexico (<30°)	42 193 928	40 749 212	82 943 140	0.5087 (0.5086 to 0.5088)

Data for the United States and Mexico include 1958-97. Data for all European countries include 1950-99. The male:female ratio was calculated as male live births divided by total live births.

In the two continents, the total male birth deficit was 1 193 407 live births.

Central Europe and the southern countries span latitudes equivalent to the United States. The male to female ratio for the total number of births of these two European regions was significantly higher than that for the United States ($\chi^2=499$, $P < 0.0001$).

The Nordic countries span latitudes equivalent to Canada. Although the male to female ratio in these countries was higher than in Canada, this difference was not significant.

Comment

In Europe, significantly more male babies were born in southern latitudes than in northern latitudes,

whereas the reverse was found in North America. We are unable to explain these findings, which do not support a temperature related effect.

We thank Mie Inoue, World Health Organization; Garry Mac Donald, Statcan; Catherine Vella, National Statistics Office, Malta; and Pablo Aviles Hernandez, Mexican National Statistical Office, Mexico.

Funding: None.

Competing interests: None declared.

- 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.

(Accepted 4 October 2001)

One hundred years ago

Request for advice

C. C. S. writes: I shall be glad to hear the experience of any fellow practitioner who has used a locomobile. Have they been sufficiently perfected to justify the giving up of one's horse and carriage for one? What is the average monthly working cost, and how does it compare with a petrol car in this respect? My practice

is suburban, flat country, and no long distances. I like the quietness of the steam car and the comparative freedom from smell. I shall be glad to hear what the relative advantages and disadvantages are. Any hints as to the choice of a car, etc., will be appreciated. (BMJ 1902;ii:939)

Department of Obstetrics and Gynaecology, St Luke's Hospital Charles Savona-Ventura consultant

Medical School, University of Malta, Msida MSD 06, Malta
P Vassallo-Agius consultant
paediatrician

Correspondence to: V Grech
victor.e.grech@magnet.mt