sampling to public health authorities. Consumers—particularly those susceptible to infectious diseases (for example, infants, elderly people, immunocompromised patients)—should also be warned that a nil risk cannot be warranted for raw milk products.

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1 Benenson AS. *Control of communicable diseases in man*. Washington, DC: American Public Health Association, 1990.

- 2 Potelon JL, Ferley JP, Zmirou D, Entressangle S. Epidémie de Salmonella paratyphi java dans une commune de l'Isère, en octobre 1988. *Bulletin Épidémiologique Hebdomadaire* 1989;24:98-9.
- 3 Grimont PAD, Bouvet P. Les salmonelloses et les shigelloses en 1990 en France. *Bulletin Épidémiologique Hebdomadaire* 1991;25:102.
- 4 Talbot JC, Wancob DW, Robertson L, Parrell ID. A milk-borne outbreak of food poisoning due to Salmonella paratyphi B var java. *Public Health* 1967;81:191-7.
- 5 Robinson DA, Edgar WJ, Gibson GL, Matchett AA, Robertson L. Campylobacter enteritis associated with consumption of unpasteurised milk. *BMJ* 1979;i:1171-3.
- 6 Robinson DA, Jones DM. Milk-borne campylobacter infection. *BMJ* 1981; 282:1374-6.
- 7 Wright EP, Tillett HE, Hague JT, Clegg FG, Darnell R, Culshaw JA, et al. Milk-borne campylobacter enteritis in a rural area. *Journal of Hygiene (Cambridge)* 1983;91:227-33.
- 8 Linnan MJ, Mascola L, Lou XD, Goulet V, May S, Salminen C, et al. Epidemic listeriosis associated with Mexican-style cheese. *N Engl J Med* 1985;319:823-8.
- 9 Bille J. Epidemiology of human listeriosis in Europe with special reference to The Swiss outbreak. In: Miller AJ, Smith JL, Somkuti GA, eds. *Foodborne listeriosis*. Amsterdam: Elsevier, 1990:71-4.
- 10 Cazenave, Desenclos JC, Maillot E, Benoit S, Deschenes G, Baron S. Ecllosion de syndrome hémolytique et urémique (SHU) dans une communauté rurale du Cher. *Bulletin Épidémiologique Hebdomadaire* 1993;48:222-4.
- 11 Felix A, Callow BR. Paratyphoid B-Vi phage-typing. *Lancet* 1951;iii:10-4.
- 12 Ezquerro E, Burnens A, Jones C, Stanley J. Genotypic typing and phylogenetic analysis of Salmonella paratyphi B and S java with IS 200. *Journal of General Microbiology* 1993;139:2409-12.
- 13 Institut National de la Statistique. *Recensement général de la population de 1990: logement, population, emploi; évolutions 1975-1982-1990*. Paris: Ministère de l'Economie, des Finances et du Budget, INS, 1991.
- 14 Schlesselman JJ. *Case-control studies: design, conduct and analysis*. New York: Oxford University Press, 1982.
- 15 Chauvin P, Diaz C, Garnerin P, Guiguet M, Massari V, Saidi Y, et al. Réseau National Télé-informatique de surveillance et d'information sur les maladies transmissibles: bilan de la surveillance épidémiologique des médecins sentinelles en 1992. *Bulletin Épidémiologique Hebdomadaire* 1993;21:93-6.
- 16 Commission of the Codex Alimentarius. *Guidelines for the application of the hazard analysis critical control point (HACCP) system*. Rome: Food and Agricultural Organisation (United Nations), World Health Organisation, 1993. (Codex alimentarius, alinorm 93/13A, appendix II.)

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Ethnic differences in the outcome of serum screening for Down's syndrome

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Serum screening for Down's syndrome was introduced in Oldham health district in January 1991 to reduce the false positive rate associated with screening based on age alone and to improve the detection rate.¹ A retrospective analysis was undertaken to evaluate whether these objectives were achieved throughout the entire obstetric population in Oldham.

Subjects, methods, and results

All women booked at the Royal Oldham Hospital and the community clinic before 18 weeks' gestation are counselled and offered serum screening by the booking midwife, who also records their ethnic origin. The gestation is confirmed by an ultrasound scan. α Fetoprotein and intact human chorionic gonadotrophin values are measured by enzyme immunoassay. The risk for Down's syndrome is calculated from the two analyte results (adjusted for weight) and the maternal age.² Women who have a positive result (estimated risk of 1 in 300 or higher of a fetus with Down's syndrome) are counselled by a senior obstetrician and offered an amniocentesis. A trained interpreter is used if necessary.

Between 1 February 1991 and 31 October 1993, of the 9217 women offered serum screening 1655 (18%) were classified as "Indian Asians"—that is, from the Indian subcontinent. Pakistani and Bangladeshi women formed the largest subgroups, 956 (10.3%)

and 605 (6.5%) respectively, with Indians and East African Indians accounting for the rest. Other ethnic minorities were counted together with the white population because of their small numbers: West Indian 51 (0.5%), Chinese 22 (0.2%), African 6 (<0.1%), Arab 9 (<0.1%), Mediterranean 6 (<0.1%). The outcomes of the pregnancies in the study population were determined from the obstetric, paediatric, and regional cytogenetics databases; the last includes all antenatal and postnatal karyotyping carried out in the North West region. In addition, all children with Down's syndrome known to social workers were identified. Proportions within ethnic groups were compared by using χ^2 tests and 95% confidence intervals³ calculated for proportions and for the relative risks of positive screening.

Among the white and other women, serum screening improved the detection rate for Down's syndrome from a maximum of 25% (3/12) for a 7.8% amniocentesis rate if selection for amniocentesis had been based on age alone to 42% (5/12) for a 3.5% amniocentesis rate (table). It also extended the opportunity for screening to women under 35, in whom 80% of Down's pregnancies in these women occurred. In women of Asian origin, however, there was a significantly higher false positive screening rate (12.3% v 3.4%), seen both in those aged 35 and over and in those aged under 35, with no evidence of a higher incidence of Down's syndrome or an improved detection rate. The failure to detect either of the two babies with Down's syndrome born to serum screened Asian women was not due to their significantly lower uptake of amniocentesis. Both babies were born to women who gave a negative result on screening.

Comment

The apparent failure of serum screening in the Asian population may be due to ethnic influences (cultural and religious beliefs, uncertainty about age) as well as racial differences. The age specific risk estimates and

	All women	White and other	Indian Asians
Total eligible for screening	9217	7562	1655
Uptake of serum screening	7953 (86.3)	6765 (89.5)	1188 (71.8)
Women screened positive	382 (4.8)	236 (3.5)	146 (12.3)
Relative risk			3.5 (2.9 to 4.3)
Amniocentesis uptake	179 (48)	142 (60)	37 (27)
χ^2			43.9 ($P < 0.001$)
Detection rate for Down's syndrome	5/14 (36)	5/12 (42; 13 to 72)	0/2 (0; 0 to 84)
Positive predictive value	1:76 (5/382)	1:47	0:146
No of cases of Down's syndrome:			
Identified antenatally	6*	6*	0
Identified postnatally	12†	9†	3†
Rate per 1000 births	1.8‡	1.8‡	1.8

*Includes one case of Down's syndrome identified by primary amniocentesis; details available from the authors on request.

†Includes the Down's syndrome births missed by serum screening and those occurring in unscreened women.

‡After a 23% reduction in antenatally diagnosed and terminated cases to allow for the increased fetal death rate in pregnancies with Down's syndrome diagnosed by amniocentesis but not ending in a termination.¹

the medians of the biochemical markers used in the United Kingdom are derived from largely white populations and extrapolated to other populations on the assumption that "there is no reason to believe that they cannot be generally applied."¹ Yet racial differences have been found in the age specific rates for Down's syndrome⁴ and in the medians of the biochemical markers.⁵

This study suffers from the disadvantage that it is retrospective and confined to one health district. Nevertheless, it highlights the need for outcome data on serum screening to be collected by ethnic group, so that problems experienced by specific groups can be recognised and addressed. To date none of the published studies on serum screening has looked at the outcome by ethnic group. Ethnic minorities form a significant proportion of the obstetric population of some health districts, and to justify serum screening in these groups it must be based on validated risk estimations and be shown to be effective.

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- 1 Cuckle HS, Wald NJ. Screening for Down's syndrome. In: R J Lilford, ed. *Prenatal diagnosis*. London: Butterworth, 1990:67-92.
- 2 Reynolds TN, Penney MD. The mathematical basis of multivariate risk screening with special reference to screening for Down's syndrome associated pregnancy. *Ann Clin Biochem* 1989;26:26-37.
- 3 Gardner MJ, Altman DG, eds. *Statistics with confidence*. London: BMJ, 1989.
- 4 Rodgers MS. Racial variations in the incidence of trisomy 21. *Br J Obstet Gynaecol* 1986;93:587-99.
- 5 Bogart MH, Jones OH, Felder RA, Best RG, Bradley I, Butts W, et al. Prospective evaluation of maternal serum human chorionic gonadotrophin levels in 3428 pregnancies. *Am J Obstet Gynaecol* 1991;165:663-7.

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Genetics versus environment in inflammatory bowel disease: results of a British twin study

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A genetic component to the cause of inflammatory bowel disease has been inferred from the increased risk among first degree relatives (5-20% cumulative incidence).¹ The only previous study of inflammatory bowel disease in twins used the Swedish twin registry and a register of hospital inpatients to identify 80 twin pairs.² The aim of our study was to determine the levels of concordance for inflammatory bowel disease in British twin pairs.

Subjects, methods, and results

The National Association for Colitis and Crohn's Disease is a patient support group with about 16 000 members with inflammatory bowel disease. All members were asked to complete and return a prepaid postcard if they had inflammatory bowel disease and were born as one of a twin pair. Those replying were

sent a follow up questionnaire to obtain details of the member's diagnosis and twin. Zygosity was determined with a validated questionnaire.³

A report of inflammatory bowel disease in a proband's twin was confirmed by contacting the twin. All self reported diagnoses of inflammatory bowel disease were confirmed by contacting the patient's hospital physician or surgeon. Concordance rates for inflammatory bowel disease were compared by using Fisher's exact and Mantel-Haenszel χ^2 tests.

Completed questionnaires were obtained for 150 twin pairs in which at least one member had inflammatory bowel disease. For six twin pairs it was not possible to determine zygosity; these were excluded from analysis. The mean age of the probands was 32 (SD 13) years, the mean duration of their illness was 10 (9) years, and the mean age until which the twins had lived in the same house was 20 (3) years. In total, 15 pairs of twins were concordant for inflammatory bowel disease.

In 14 cases the reported diagnosis of inflammatory bowel disease in a proband's twin was confirmed; in one case the twin had died. The nature of the inflammatory bowel disease in concordant twin pairs was the same in all pairs. We were able to validate the diagnosis of inflammatory bowel disease in 149/159 patients (94%); in only one case was the diagnosis refuted. In four cases the diagnosis of Crohn's disease was changed to ulcerative colitis and vice versa in