- 15 Wang Z-M, Pierson RN, Heymsfield SB. The five-level model: a new approach to organise body composition research. Am J Clin Nutr 1992; 56: 19–28.
- 16 Heymsfield SB, Waki M. Body composition in humans: Advances in the development of multi-compartment chemical models. *Nutr Rev* 1991; 49: 97–108.
- 17 Wang J, Thornton JC, Russell M, Burastero S, Heymsfield SB, Pierson RN. Asians have lower BMI (BMI) but higher percent body fat than do Whites: comparisons of anthropometric measurements. Am J Clin Nutr 1994; 60: 23–28.
- 18 Guricci S, Hartriyanti Y, Hautvast JGAJ, Deurenberg P. Relationship between body fat and body mass index: differences between Indonesians and Dutch Caucasians. Eur J Clin Nutr 1998; 52: 779–83
- 19 Deurenberg P, Yap M, Staveren van WA. Body mass index and percent body fat: a meta analysis among different ethnic groups. *Int J Obesity* 1998; 22: 1164–71.
- 20 Swinburn BA, Ley SJ, Carmichael HE, Plank LD. Body size and composition in Polynesians. *Int J Obes* 1999; **23:** 1178–83.
- 21 Deurenberg-Yap M, Schmidt G, Staveren van WA, Deurenberg P. The paradox of low body mass index and high body fat percent among Chinese, Malays and Indians in Singapore. *Int J Obes* 2000; 24: 1011–17.
- 22 He M, Tan KCB, Li ETS, Kung AWC. Body fat determination by dual energy X-ray absorptiometry and its relation to body mass index and waist circumference in Hong Kong Chinese. *Int J Obes* 2001; 25: 748-52
- 23 Wagner DR, Heyward VH. Measures of body composition in blacks and whites: a comparative review. *Am J Clin Nutr* 2000; 71: 1392–402.

- 24 Deurenberg P, Ge K, Hautwast JGAJ, Wang J. Body mass index as predictor for body fat: comparison between Chinese and Dutch adult subjects. Asia Pacific J Clin Nutr 1997; 6: 102–05.
- 25 Deurenberg P, Deurenberg-Yap M. Validity of body composition methods across ethnic population groups. In: Elmadfa I, Anklam E, König JS, eds. Modern aspects of nutrition: present knowledge and future perspectives. Forum Nutr Basel Karger 2003; 56: 299–301.
- 26 Ko GTC, Chan JC, Cockram CS, Woo J. Prediction of hypertension, diabetes, dyslipidaemia or albuminuria using simple anthropometric indexes in Hong Kong Chinese. *Int J Obes* 1999; 23: 1136–42.
- 27 Gallagher D, Heymsfield SB, Heo M, Jebb, SA, Murgatroyd PR, Sakamoto Y. Healthy percentage body fat ranges: an approach for developing guidelines based on body mass index. Am J Clin Nutr 2000; 72: 694–701.
- 28 Deurenberg-Yap M, Chew SK, Lin FP, van Staveren WA, Deurenberg P. Relationships between indices of obesity and its comorbidities among Chinese, Malays and Indians in Singapore. *Int J Obes* 2001; 25: 1554–62.
- 29 Cooperative Meta-Analysis Group of China Obesity Task Force. Predictive values of body mass index and waist circumference to risk factors of related diseases in Chinese adult population [Chinese]. Chin 7 Epidemiol 2002. 23: 5–10.
- 30 Zhou B-F. Predictive values of body mass index and waist circumference for risk factors of certain related diseases in Chinese adults—study on optimal cut-off points of body mass index and waist circumference in Chinese adults. *Biomed Environ Sci* 2002; 15: 83–95.
- 31 Yajnik CS. The lifestyle effects of nutrition and body size on adult adiposity, diabetes and cardiovascular disease. *Obesity Rev* 2002; 3: 217–24

Clinical picture

The Y-Y paradox

Chittaranjan S Yajnik, John S Yudkin



Body fat 9·1% 21·2%

The two authors share a near identical body-mass index (BMI), but as dual X-ray absorptiometry imagery shows that is where the similarity ends. The first author (figure, right) has substantially more body fat than the second author (figure, left). Lifestyle may be relevant: the second author runs marathons whereas the first author's main exercise is running to beat the closing doors of the

elevator in the hospital every morning. The contribution of genes to such adiposity is yet to be determined, although the possible relevance of intrauterine undernutrition is supported by the first author's low birthweight. The image is a useful reminder of the limitations of BMI as a measure of adiposity across populations.

Diabetes Unit, KEM Hospital Research Centre, Rasta Peth, Pune 411011, India (C S Yajnik MD); International Health and Medical Education Centre, University College London, UK (J S Yudkin FRCP)