table. A χ^2 test for trend (one degree of freedom) was 3·8 for daily number of cigarettes (one tail, $p \sim 0\ 03$) and 3·1 for total (life-long) consumption of cigarettes ($p \sim 0{\cdot}04$).

The results suggest that exposure to environmental tobacco smoke may contribute to the cause of COLD. A relative risk of about 2 among passive smokers is unlikely to be explained in terms of misclassification of current or past smokers as non-smokers.[4] The lack of a dose-response pattern should not be surprising, given the multitude of factors (endogenous and exogenous) that may be involved in the aetiology of COLD. The smoother relative risk pattern in relation to lifelong cigarette consumption may reflect the importance of time-weighted exposure to environmental tobacco smoke in determining COLD risk.

Department of Hygiene and Epidemiology, University of Athens Medical School, Athens 115-27, Greece — ANNA KALANDIDI, D. TRICHOPOULOS, A. HATZAKIS

Hospital for Respiratory Diseases, Athens, Greece — S. TZANNES

International Agency for Research on Cancer, Lyon, France. — R. SARACCI

1. US Department of Health and Human Services. The health consequences of smoking. Chronic obstructive lung disease: a report of the Surgeon General US Department of Health and Human Services, Public Health Service, DHHS (PHS) 84-50205, 1984.
2 US Department of Health and Human Services. The health consequences of involuntary smoking: a report of the Surgeon General US Department of Health and Human Services, Public Health Service, DHHS (CDC) 87-8398, 1986
3 Trichopoulos D, Kalandidi A, Sparros L, MacMahon B. Lung cancer and passive smoking *Int J Cancer* 1981, **27:** 1–4.
4. Wald N, Nanchahal K, Thompson S, Cuckle H. Does breathing other people's tobacco smoke cause lung cancer? *Br Med J* 1986; **293:** 1217–22.

IMMUNISATION OF THE PRETERM BABY

SIR,—No firm guidelines exist for the immunisation of preterm babies against diphtheria, tetanus, and pertussis (DTP), and poliomyelitis. Practices vary from no correction to full correction for gestational age and are largely without scientific foundation.[1] We report the preliminary results of a study to assess the response of preterm infants to immunisation schedules which make no allowance for prematurity.

Babies born at or before 35 weeks' gestation were entered into the study after the parents gave informed written consent. The infants were randomised to one of three immunisation schedules: immunisation at 3, 4, and 5 months of age (A); at 3, 4, and 5 months with a booster at 18 months (B); and at 3, 4, and 10 months (C). On each occasion all infants receive three drops of live oral poliovaccine (trivalent Sabin type), and 0·5 ml of adsorbed DTP or diphtheria/tetanus vaccine by intramuscular injection into the lateral aspect of the upper thigh. Serum for measurement of antibodies was obtained immediately before the first dose and 1 month after the third dose. Further samples will be taken at 19 months and 4 years of age. The study infants have had the wide range of problems expected in preterm babies.

Diphtheria and tetanus antitoxin concentrations in the sera were measured by ELISA.[2] Human reference sera of known potencies determined by in-vivo neutralisation tests were included in each assay. Antibodies to *Bordetella pertussis* were also measured by ELISA but with the supernatant from centrifuged sonicated cells of *B pertussis* strain W28 at a concentration of 8 μg protein per μl as antigen. A serum pool from normal DTP-vaccinated children was used as a reference in each assay and given a nominal concentration of 100 pertussis antibody units (PAU) per ml. Antibodies were detected using alkaline phosphatase conjugated anti-human polyvalent immunoglobulins (raised against α, γ, and μ chains). Antibodies to polioviruses were assayed by a neutralisation method in cell cultures in microtitre plates.[3]

Diphtheria and tetanus antitoxin levels, and antibody titres to *B pertussis* and polio (strains 1, 2, and 3), have now been measured in 50 infants after the primary course of immunisation (23 group A, 17 group B, and 10 group C). Irrespective of gestational age (mean 31·7 [SD 2·6] weeks, range 26–35) or immunisation schedule, all babies achieved adequate levels of immunity. All achieved protective antibody levels (greater than 0·01 IU/ml) to diphtheria and tetanus, and showed a significant rise in PAU/ml. Most achieved polio-antibody titres greater than 1/256 (the lowest titre was 1/8 to type 1 virus). There have been no abnormal local or general reactions to immunisation so far. No difficulties have been encountered with intramuscular injections.

Our preliminary results show that the preterm baby can respond adequately to routine immunisation starting 3 months after birth and can achieve immunity by 6 months of age, which confirms the findings of Bernbaum et al.[4] Early protection against pertussis is clearly desirable in a population liable to respiratory problems and potentially at greater risk of apnoea and secondary pneumonia. Parental compliance in the immunisation procedure is likely to be greater with an earlier timing of the first immunisation. We await the results of future antibody/antitoxin measurements during childhood in our study groups to determine the persistence of the induced immunity prior to the pre-school booster. Our early evidence suggests, however, that there is no need to delay the start of immunisation in the preterm infant beyond 3 months from the actual date of birth.

We are grateful to Dr J. W. G. Smith for advice.

Department of Infectious Diseases, Seacroft Hospital, Leeds — S. P. CONWAY

University Department of Paediatrics and Child Health, General Infirmary at Leeds, Leeds LS2 9NS — J. R. JAMES, R. W. SMITHELLS

National Institute for Biological Standards and Control, Potters Bar, Hertfordshire — M. MELVILLE-SMITH, D. MAGRATH

1 Lingam S, Miller C, Pateman J, et al. Immunisation of preterm infants. *Br Med J* 1986, **292:** 1183–85.
2. Melville-Smith ME, Seagroatt VA, Watkins JT A comparison of enzyme-linked immunosorbent assay with the toxin neutralisation test in mice as a method for the estimation of tetanus antitoxin in human sera. *J Biol Stand* 1984; **11:** 137–44.
3. Joseph CA, Begg NT, Stanwell-Smith RE, Magrath DI. Antibody state to poliovirus in first year university students, 1984. *Br Med J* 1987; **295:** 171–73.
4 Bernbaum JC, Daft A, Anolik R, et al. Response of preterm infants to diphtheria-tetanus-pertussis immunisations *J Pediatr* 1985; **107:** 184–88

WHICH TRANSFORMATION FOR NORMALISING SKINFOLD AND FATNESS DISTRIBUTIONS?

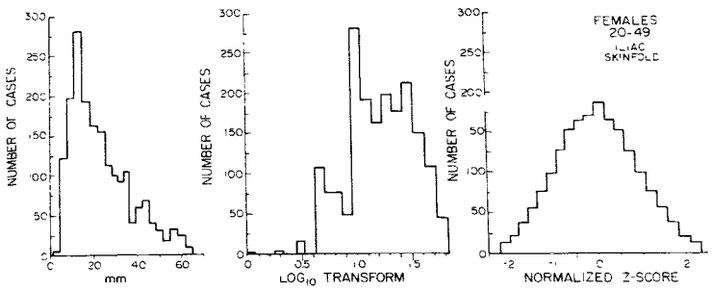
SIR,—Skinfolds, fat-weights, and body weights tend to be positively skewed in their distributions, suggesting a biological "floor" to fatness but no ceiling. Such departures from a bell-shaped curve complicate statistical analysis. Data are often presented and analysed after transformation, a $\log_{10}$ transform being popular.[1-3] However, it is not certain whether $\log_{10}$ transformation truly normalises such distributions or whether it introduces new directions of skewness and increased kurtosis.

We have analysed four skinfolds plus body weight at three age levels for 2635 males and 2885 females. We looked at untransformed distributions and at distributions transformed in three ways ($\log_{10}$, square root, and normalised Z-score[4,5]). We calculated centiles for all the 120 ($5 \times 3 \times 2 \times 4$) distributions and estimated skewness and kurtosis.[6,7] For the Z-score transforms we also compared the results

TABLE I—SKEWNESS AND KURTOSIS OF RAW SCORES AND $\log_{10}$ TRANSFORMED VALUES, ILLUSTRATED FOR ILIAC SKINFOLD IN MALES AND WEIGHT IN FEMALES

		Centiles for raw values					Centiles for $\log_{10}$ transformed values				
Age (yr)	No	5	15	50	85	95	5	15	50	85	95
Iliac skinfold: males (mm)											
15–19	416	6	7	15	33	50	0·78	0 85	1·18	1 52	1·70
20–49	1639	6	10	23	37	47	0 78	1·00	1·36	1 57	1 67
50–75	580	6	11	22	32	42	0 78	1·04	1 34	1·50	1·68
Weight: females (kg)											
15–19	401	45	49	57	67	79	1·65	1 69	1·76	1·83	1 90
20–49	1851	48	52	61	75	87	1·68	1·72	1·79	1·88	1 94
50–75	633	48	54	66	81	93	1 68	1·73	1·82	1·91	1·97

Source: Tecumseh, Michigan, community health survey examination, round 2.



Distributions of iliac skinfold in women aged 20–49.

with theoretical values of Z at the 5th, 15th, 50th, 85th, and 95th centiles.[4] We wanted to find out how well transformations converted the skinfold and body weight distributions into gaussian form.

With only one exception, all the untransformed distributions were positively skewed, with a long tail to the right, as expected. Skewness exceeded chance expectation ($p < 0.01$) for 27 of the 30 distributions and kurtosis did so in 21. Untransformed skinfolds and weight are illustrated in table I and the figure. Log_{10} transformed skinfolds and weights were also skewed, this time to the left (negative skewness), and skewness was significant ($p < 0.01$) in more than half of the log_{10} transformed distributions. Kurtosis was diminished with the log_{10} transform, though it remained high where it was high in the raw distributions of skinfold and weight. Table I and the figure illustrate the conversion from positively skewed raw-value distributions to negatively skewed distributions after log_{10} transformation. The simple square-root transform was only moderately effective in reducing skewness and kurtosis.

TABLE II—COMPARISON OF ACTUAL AND THEORETICAL NORMALISED Z-SCORE VALUES FOR ILIAC SKINFOLD

Age (yr)	Z-score for iliac skinfold at centile:				
	5	15	50	85	95
Theoretical value	−1·65	1·04	0·00	1·04	1 65
Females					
15–19	−1·57	−1·01	0·00	1 01	1·57
20–49	−1·58	−1·01	0·00	1·01	1 58
50–75	−1 50	−0·97	0·00	0 97	1·50
Males					
15–19	−1·57	−1 01	0·00	1·01	1 57
20–49	−1·57	1·01	0·00	1·01	1·57
50–75	−1·47	−0·97	0·00	0 97	1·47

Source: Neter, Wasserman, and Kutner,[4] table A-1, for theoretical values.

Normalised Z-scores proved to be an effective transform (table II). For all 30 skinfold and weight distributions so transformed the 50th percentile was equal to a Z of 0·00. The symmetrical, gaussian form of the Z-scored distribution of the iliac skinfold in women is shown in the figure. The popular log_{10} transform does not effectively normalise positively skewed distributions of skinfolds and weight in adolescents or adults while the use of normalised Z-scores results in distributions that are closely gaussian.

Center for Human Growth,
University of Michigan,
Ann Arbor, Michigan 48109, USA

STANLEY M. GARN
TIMOTHY V. SULLIVAN
THOMAS TENHAVE

1. Mueller WH, Wohleb JC. Anatomical distribution of subcutaneous fat and its description by multivariate methods: how valid are the principal components? *Am J Phys Anthropol* 1981; **54:** 25–35
2. Ducimetière P, Richard JL "Central obesity" and coronary heart disease *Lancet* 1987, ii· 579–80.
3. Ducimetière P Subcutaneous fat distribution and coronary heart disease risk in a middle-aged male population. In: Norgan NG, ed. Human body composition and fat distribution: report of an EC workshop. London: EURONUT, 1985. 219–26.
4. Neter J, Wasserman W, Kutner MH. Applied linear statistical models, 2nd ed. Homewood, Illinois· Irwin, 1985: 7.
5. Abramowitz M, Stegun IA. Handbook of mathematical functions. Washington: US Government Printing Office, 1964. G931.
6 Snedecor GW, Cochran W'G Statistical methods, 6th ed. Ames, Iowa: Iowa State University Press, 1967. 86–90, 552.
7. Conover WJ Practical nonparametric statistics New York· Wiley, 1971 301–05

PASINI'S REGIONAL JEJUNITIS

SIR,—Professor Rai and colleagues (Oct 31, p 1020) describe an epidemic regional jejunitis as a new clinical entity. This disease has been known in Yugloslavia since 1949, and it carries the name Pasini's disease.[1-3] Dr Josip Pasini described the disease in southern Croatia Yugoslavia as a gangrenous, haemorrhagic, and very often perforating inflammatory segmental disease of the jejunum. The disease had a regional character and a severe clinical picture, and it was often fatal. The description of the disease was based on 26 patients treated between 1944 and 1948. Bacteriological, toxicological, histological, and some experimental studies were done, but the cause was never found. One speculation was chemicals used to preserve food sent to Yugoslavia between 1944 and 1949; the disease was unknown before 1944. The condition was at first thought to be a modification of Crohn's disease but the histopathological picture was completely different, and it was given a new name. The disease disappeared and the term Pasini's disease has seldom been used. Now a very similar (or even the same) disease has been reported in India. The name of a very talented but unassuming surgeon from Šibenik in Croatia-Yugoslavia should not be forgotten.

Department of Gastroenterology,
University Hospital Rebro,
41000 Zagreb, Yugoslavia

STOJAN KNEŽEVIĆ

1. Pasini J. Prilog hemoragičnom enteritisu (enteritis haemorrhagica lumen stenoticans). *Lij Vjes* 1951; **73:** 197–203.
2. Pasini J. Neobično oboljenje jejunuma. *Lij Vjes* 1949; **71:** 8–14.
3 Pasini J. Proceedings of XIVth Congress of the International Society of Surgery, Allergy, and Abdominal Surgery (Paris, 1951): 679.

LFA-1, LFA-3, AND ICAM-1 EXPRESSION IN BURKITT'S LYMPHOMA

SIR,—Dr Clayberger and colleagues (Sept 5, p 533) report the absence of cell surface lymphocyte-function-associated antigen 1 (LFA-1) on high-grade lymphomas, especially Burkitt's lymphoma (BL). LFA-1 has broad immunological functions.[1] It is well recognised that many Epstein-Barr virus (EBV) positive BL cell lines are neither recognised nor killed in vitro by virus-specific cytotoxic T lymphocytes (CTL), while lymphoblastoid cell lines (LCL) established by EBV infection of the normal peripheral B cells from the same patients are destroyed by CTL.[2] The non-expression by the tumour cells of viral antigens, targets of specific CTL, could represent a mechanism of immunological escape important in the genesis of BL.[2,3] Few data are available concerning immunity against BL not associated with EBV, which nonetheless represents 85% of BL in Europe and in the USA.

We have also used fluorescence activated cell sorting (FACS) to analyse a large panel of BL cell lines, not only for LFA-1 expression but also for LFA-3 (a protein of 60 kD expressed by leucocytes, thymic epithelial cells, and dendritic cells[4]), and for intercellular adhesion molecule 1 (ICAM-1), which is one of the putative ligands of LFA-1.[5] Of the BL cell lines tested, 13 were associated with EBV and 10 were not. We found a low expression of all three markers in the non-EBV associated BL. In contrast, expression of all three markers was higher in BL associated with EBV (table). All of the 15 non-malignant LCL tested were positive for all three antigens. Northern blotting done with LFA-1 β-chain cDNA[6] showed that the level of regulation appeared to be transcriptional because no

LFA-1, LFA-3, AND ICAM-1 EXPRESSION ON BURKITT'S LYMPHOMA (BL) CELL LINES*

Marker	BL		EBV positive non-malignant LCL (n = 15)
	EBV negative (n = 10)	EBV positive (n = 13)	
LFA-1	1	5	15
LFA-3	2	8	15
ICAM-1	3	12	15

*All BL lines were established at IARC, and phenotypes were analysed at early passages of the cultures BL were scored as negative if fluorescence positivity was less than 5%. Monoclonal antibodies used against α-chain and β-chain of LFA-1 were IOT16 and LFA-54, and against LFA-3 and ICAM-1 were TS2 9 and RR1 1, respectively.