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LOW BIRTH WEIGHT IN SOUTH ASIAN BABIES IN BRITAIN : TIME TO REDUCE THE INEQUALITIES

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Abstract : Babies born in Britain to women of South Asian ethnic origin are lighter on average than the offspring of women of European origin. The causes have been incompletely elucidated but nutritional factors, low socioeconomic status and maternal pre-pregnancy weight have been implicated. This health inequality has received little policy prioritization in Britain. As further research clarifies reasons for this differential, appropriately targeted preventive strategies need to be implemented.

Key words : South Asian, low birth weight

1. INTRODUCTION

There are a number of subgroups within the United Kingdom (UK) who do not enjoy the same health as the rest of the population. One such subgroup are people who originate from the Indian subcontinent ('South Asians') who are born with persistently lower birth weight compared with White Europeans in the UK. In this review I would like to describe this effect, discuss possible exposures that may account for it and explore policies that attempt to redress the differential.

1.1 Definition of South Asians

In the UK, South Asians are a heterogeneous group comprising men and women originating from the Indian subcontinent, Pakistan and Bangladesh. They share a common heritage including culture, history, political system, religion, language, geographical origin, traditions, myths, behaviours, foods, genetic similarities and physical features.

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Table 1. Ethnic distribution in 2001 UK Census

		Total population		Ethnic population %
		Count	%	
White		54153898	92.1	—
Mixed		677117	1.2	14.6
Asian	Indian	1053411	1.8	22.7
	Pakistani	747285	1.31	6.1
	Bangladeshi	283063	0.5	6.1
	Others	247664	0.4	5.3
Black	Caribbean	565876	1.0	12.2
	African	485277	0.8	10.5
	Other	97585	0.2	2.1
Chinese		247043	0.4	5.3
Others		230975	0.3	5.1
All minority ethnic population		4635296	7.9	100
% of whole population		58789194	100	7.9

Source : National Statistics website: www.statistics.gov.uk
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1.2 Numbers of South Asians in Britain

The numbers of South Asian and other ethnic groups identified by self report in the 2001 UK census¹⁾ is shown in Table 1. Clearly, South Asians are a minority in Britain.

1.3 Health status of South Asians

The health status and risk factors in South Asians differ from national rates in the UK. South Asian men and women have higher mortality from coronary heart disease (CHD) and stroke²⁾ but lower mortality from cancer. Amongst adult South Asians there are higher rates of obesity, central fat distribution and insulin resistance than in white Europeans^{3,4)}. South Asians in Britain have a higher prevalence of diabetes⁵⁾ than the general population. Smoking is more prevalent in Bangladeshis than other South Asian groups and White Europeans⁶⁾.

2. LOW BIRTH WEIGHT

The categories of birth weight are : low birth weight (<2,500 g), very low birth weight (<1,500 g), extremely low birth weight (<1,000 g). Nationally, approximate-

Table 2. Incidence of low birth weight by ethnic group in the UK

Ethnic group of mother	Number of pregnancies	Proportion <2,500 g at birth (%)	Mean (SD) birth weight (g)
White	115,176	5.0	3,377 (548)
Mediterranean	2,640	5.8	3,299 (547)
Other	2,661	6.6	3,274 (567)
Oriental	12,348	6.6	3,231 (532)
African	3,896	9.2	3,214 (617)
African-Caribbean	4,561	9.4	3,156 (604)
Indo-Pakistani	22,190	10.1	3,082 (527)

Adapted from Steer *et al.* 1995 [6]

ly 33% of term babies are born low birth weight⁷⁾. Term infants may be low birth weight because they are 'small for gestational age' or 'light for date' infants. Low birth weight is defined as less than the 10th percentile of the index population's distribution of birth weights by gestation (i.e. lowest 10 percent of birth weights).

Several studies have shown low birth weight occurs more commonly in South Asian babies than white European babies in the UK^{8,9)}; (Table 2). Low birth weight, as marker of intrauterine growth restriction, has been strongly associated with chronic diseases in adulthood such as cardiovascular disease¹⁰⁾, hypertension¹¹⁾ and diabetes¹²⁾. Low birth weight has been reported to persist in second generation South Asians in the UK¹³⁾. In India, fat patterning at birth is also different in South Asian babies who tend to have a phenotype that favors adult cardiovascular disease and diabetes¹⁴⁾. Whether this also occurs as a result of exposures in utero has not been determined.

2.1 Why is low birth weight potentially a public health problem ?

Perinatal problems related to intrauterine growth restriction include : perinatal death, fetal distress, meconium aspiration syndrome, hypoglycaemia, polycythaemia or hyperviscosity and hypothermia. As noted, of potentially greater public health importance however is the observation that intrauterine growth restriction is associated with disease in adulthood^{11,12-15)}. It suggests that current health promotion strategies, directed at chronic disease in adulthood, may be irrelevant or ineffective. If early life exposures are important, then health promotion should be targeted at women in the reproductive years which has the potential to benefit future generations of adults.

2.2 Possible reasons behind such differentials

Possible reason for low birth weight in South Asians include genetic factors,

placental and hormonal factors, suboptimal maternal nutrition in pregnancy, chronic infections, low pre-pregnancy weight, smoking and low socioeconomic status.

2.2.1 Genetic factors

South Asian neonates may be “constitutionally small” due to a genetic predisposition rather than fetal growth restriction. Mothers in India are smaller than mothers in the UK (weight, length, body mass index)¹⁴⁾ as are South Asian origin women in the UK. The genetic growth potential of a child is clearly related to parental size. The relative contribution of genes to growth and size attained compared to the contribution of environmental factors is not clear.

2.2.2 Placental and hormonal influences

Placental factors such as up/down regulation of nutrient transport, alterations in hormonal regulation or differences in vascularisation may underlie some growth restriction *in utero*¹⁶⁾. Placental function in different ethnic groups has not been investigated in detail in the UK.

Growth hormone levels have a relatively small effect on *in utero* growth, although insulin and insulin-like growth factors are key modifiers of fetal growth and development. Circulating insulin-like growth factor-1 concentrations, as measured in cord and fetal blood, are lower among growth-restricted neonates compared with appropriately-sized babies. Furthermore, fetal growth restriction is associated with reduced circulating levels of insulin like growth factor binding protein-3 (IGFBP-3) concentrations and elevated IGFBP-1 and IGFBP-2. Insulin like growth factor-1 concentrations have been found to be highest in African-Caribbeans compared with Pakistani and European adults in the UK¹⁷⁾, whereas insulin-like growth factor-2 concentrations were greatest in Europeans. Clearly, there are differences in insulin-like growth factors between ethnic groups although whether these differences commence *in utero* is not clear.

2.2.3 Maternal nutrition

An extensive literature links the quality of maternal nutritional status both pre-conceptionally and during pregnancy with fetal development. For example, of public health importance was the finding that increased folate intake prevents neural tube defects in neonates¹⁸⁾, irrespective of ethnicity. The quality of the gestational diet may also influence the growth of tissues (muscle) and organs (renal nephrons and pancreatic beta cells) during critical periods of development.

Interestingly, systematic reviews of the effects of nutritional supplementation in pregnancy in developed countries show a relatively small impact on fetal growth. Here, balanced protein/energy supplementation appears to *marginally* increase maternal weight gain and reduce numbers of small for gestational age babies¹⁹⁾. Dietary supplementation does markedly improve fetal growth among poor, under-nourished women in developing countries where the incidence of small for ges-

tational age (SGA) births is much higher²⁰. No analysis of supplementation by ethnicity has been reported.

The effect of a mother's own fetal experience on her capacity to nourish her fetus is also important. In a study in India, the birthweight of both parents predicted offspring birthweight²¹.

Low birth weight has been shown to be associated with poor maternal intake of green leafy vegetables, fruit and milk and relatively high maternal energy expenditure and work load in rural India²². Nutritional factors in South Asians in Britain are likely to be important since reduced intake of vitamin B12 and folate, due to prolonged cooking of vegetables which may destroy up to 90% of folate, have been reported in Indians living in London²³. However, a detailed study of the quality of maternal diet in pregnancy in South Asians in the UK in relation to the risk of low birth weight in offspring is needed.

2.2.4 Chronic infection

Small for gestational age births are related to viral or bacterial infections in a small number of cases (5% to 10%)²⁴. Cytomegalovirus and rubella are the viral infections most commonly associated with fetal growth restriction. Interestingly, the incidence of congenital rubella has been found to be higher in Asian than non-Asian births in England and Wales, in part due to higher susceptibility to rubella in Asian than non-Asian women²⁵. However, more recent data are needed.

2.2.5 Maternal weight

Low maternal pre-pregnancy weight (indicative of small pelvic dimensions) is associated with low birth weight and pre-term delivery particularly if accompanied by low weight gain in pregnancy^{26,27}. A study in India showed that a mother's current body mass index predicts birthweight of her offspring²¹. In a study comparing Indian mothers in India with European mothers in the UK, Indians were younger, lighter, shorter and had a lower mean body mass index (BMI=18.2 kg/m²) than UK mothers (BMI=23.4 kg/m²)²⁸. This persists in those who migrate to the UK, where South Asian women tend to be lighter and shorter than European origin women³.

2.2.6 Smoking

Cigarette smoking is associated with reduced uterine blood flow and impaired fetal oxygenation. Women who smoke during pregnancy have more than twice the relative risk of delivering an SGA child compared with their non-smoking women²⁹.

In the UK over 25% women who smoke continue to do so during pregnancy. These women tend to be young, single, of lower educational achievement, and in manual occupations. Studies have found smoking to be rare in South Asian women⁹, although because of the considerable social stigma of South Asian women smoking, these studies may underestimate the true prevalence.

2.2.7 Socioeconomic status

The incidence of low birthweight and pre-term birth is inversely related to socioeconomic status (SES)^{30,31}. Low SES in pregnancy can lead to sub-optimal fetal development via several mechanisms including maternal stress, a greater likelihood of smoking and misuse of drugs and alcohol or inadequate pre-natal care³². There is evidence of a SES gradient amongst South Asians in the UK with Indians being most likely to be in social classes I (professional), II (managerial and technical) and IIIN (non-manual skilled) and have highest median income (along with Europeans) and Bangladeshis having the lowest SES³. In a recent Department of Health (DoH) study published in the Research Findings Electronic Register, several social factors had improved between first and second generation Pakistani mothers in the UK including percent of unemployed, percent with no car, percent overcrowding, percent sharing a bathroom, percent youth unemployed and percent eligible for council tax rebate. These were correlated with a reduction in peri-natal mortality rate in Pakistani mothers (from 15.63 to 7.73 deaths per 1,000) but not low birth weight³³.

3. PREVENTION OF LOW BIRTH WEIGHT

In the UK, prevention of low birth weight in all ethnic groups and in disadvantaged groups in particular does not appear to be getting prioritization. A long term strategy of preventing adult disease by optimizing the health of reproductive women and the early life exposures of children is not yet a priority. One problem is that the true causes are multifaceted as outlined above. Another problem is that systematic reviews have shown that dietary interventions in pregnancy are equivocal. As indicated, interventions to optimize maternal pregnancy and birth outcomes in infants in developed countries have only marginal beneficial effects on birth weight¹⁹. Folate supplementation to women during their reproductive years has been a health promotion strategy, as has fortification of flour with folate to help prevent neural tube defects. However, there remains a substantial gap between randomized controlled trial evidence and treatment prioritization within the health service. An additional barrier is that the health of infants throughout childhood, rather than birth weight alone, are clearly important for later health.

4. POLICIES THAT ATTEMPT TO REDRESS THE DIFFERENTIALS

There are many programs that seek to improve the health of ethnic minorities in the UK. Although the DoH recognize that infancy and childhood are critical stages in the development of habits that affect health in adulthood, few if any programs address the issue of low birth weight.

Previously, the health care of ethnic minorities has been targeted by the DoH, for example, the policy aimed at improving mental health care (*Delivering Race Equality: A Framework for Action*³⁴). In relation to mother's health, the DoH have produced a National Service Framework for Children, Young People and Maternity Services which sets out that standard that Primary Care Trusts should follow in commissioning and delivering services for children³⁵. It sets a standard for Maternity Services highlighting the importance of antenatal care but there is little emphasis on ethnic inequalities in birth weight. Even more recently, the DoH has produced a White Paper on Public Health prioritizing health care policy in areas such as smoking, obesity, alcohol as well as mental and sexual health³⁶. Reference is made to inequalities across ethnic groups and a goal of reducing the proportion of women who smoke in pregnancy is set. Although this will inadvertently influence birth weight the primary focus appears to be tackling deprivation and disadvantage in childhood. More recently the Centre for Reviews and Dissemination have targeted ethnic minorities for the treatment of cardiovascular disease, mental health and haemoglobinopathies³⁷. However, low birth weight is not targeted at for example, women in the reproductive years.

In other countries there have been attempts to reduce low birth weight in disadvantaged groups. In Australia, where indigenous Australians are about twice as likely to be of low birthweight as babies born to non-Indigenous mothers, the National Health and Medical Research Council have developed a policy framework called 'A Healthy Start to Life' in 2002³⁸. It will focus on the factors that promote wellbeing during periods of pregnancy, infancy, childhood and adolescence. Specific areas that it target include the identification of interventions that influence maternal health, the health of the mother and fetus during pregnancy and health of the child during infancy and childhood.

5. CONCLUSIONS

South Asians are an ethnic minority group in the UK who experience a higher prevalence of low birth weight than other groups. The causes have been incompletely elucidated. There is evidence that maternal nutrition, maternal weight and socioeconomic status are associated with low birth weight in South Asians. Other factors such as the placental influences and the importance of smoking as contributing factors in this group need further investigation. This health inequality has received little policy prioritization in the UK, despite the association of low birth weight with adult chronic disease. As further research clarifies reasons for this differential, appropriately targeted preventive strategies need to be implemented.

REFERENCES

1. National Statistics Website. UK Census 2001. Available at: <http://www.statistics.gov>.

- uk/cci/nugget.asp?id=273 (accessed Apr 2005).
2. Wild S, McKeigue P. Cross sectional analysis of mortality by country of birth in England and Wales, 1970-92. *BMJ*, **314**(7082): 705-10, 1997.
 3. Bhopal R, Unwin N, White M, Yallop J, Walker L, Alberti KG, Harland J, Patel S, Ahmad N, Turner C, Watson B, Kaur D, Kulkarni A, Laker M, Tavridou A. Heterogeneity of coronary heart disease risk factors in Indian, Pakistani, Bangladeshi, and European origin populations: cross sectional study. *BMJ*, **319**(7204): 215-20, 1999.
 4. Simmons D, Williams DR, Powell MJ. Prevalence of diabetes in different regional and religious south Asian communities in Coventry. *Diabet Med*, **9**: 428-31, 1992.
 5. Riste L, Khan F, Cruickshank K. High prevalence of type 2 diabetes in all ethnic groups, including Europeans, in a British inner city: relative poverty, history, inactivity, or 21st century Europe? *Diabetes Care*, **24**: 1377-83, 2001.
 6. Bush J, White M, Kai J, Rankin J, Bhopal R. Understanding influences on smoking in Bangladeshi and Pakistani adults: community based, qualitative study. *BMJ*, **326**(7396): 962, 2003.
 7. Tucker J, McGuire W. Epidemiology of preterm birth. *BMJ*, **329**(7467): 675-8, 2004.
 8. Steer P, Alam MA, Wadsworth J, Welch A. Relation between maternal haemoglobin concentration and birth weight in different ethnic groups. *BMJ*, **310**(6978): 489-91, 1995.
 9. Thomas M, Avery V, Infant feeding in Asian Families. A survey carried out in England by the Social Survey Division of ONS on behalf of the Department of Health. Office of National Statistics. 1997.
 10. Barker DJ. The fetal origins of diseases of old age. *Eur J Clin Nutr*, **46** Suppl 3: S3-9, 1992.
 11. Barker DJ. The fetal origins of hypertension. *J Hypertens Suppl*, **14**: S117-20, 1996.
 12. Forsen T, Eriksson J, Tuomilehto J, Reunanen A, Osmond C, Barker D. The fetal and childhood growth of persons who develop type 2 diabetes. *Ann Intern Med*, **133**: 176-82, 2000.
 13. Margetts BM, Mohd Yusof S, Al Dallal Z, Jackson AA. Persistence of lower birth weight in second generation South Asian babies born in the United Kingdom. *J Epidemiol Community Health*, **56**: 684-7, 2002.
 14. Yajnik CS, Lubree HG, Rege SS, Naik SS, Deshpande JA, Deshpande SS, Joglekar CV, Yudkin JS. Adiposity and hyperinsulinemia in Indians are present at birth. *J Clin Endocrinol Metab*, **87**: 5575-80, 2002.
 15. Barker DJ. Fetal programming of coronary heart disease. *Trends Endocrinol Metab*, **13**: 364-8, 2002.
 16. Pardi G, Marconi A M, Cetin I. Placental-fetal interrelationship in IUGR fetuses—a review. *Placenta*, **23** Suppl A: S136-41, 2002.
 17. Cruickshank JK, Heald AH, Anderson S, Cade JE, Sampayo J, Riste LK, Greenhalgh A, Taylor W, Fraser W, White A, Gibson JM. Epidemiology of the insulin-like growth factor system in three ethnic groups. *Am J Epidemiol*, **154**: 504-13, 2001.
 18. Langley-Evans SC, Langley-Evans AJ. Use of folic acid supplements in the first trimester of pregnancy. *JR Soc Health*, **122**: 181-6, 2002.

19. Kramer M. Energy and protein intake in pregnancy (Cochrane Review). In: *The Cochrane Library*, Issue 1, 2004, John Wiley & Sons, Ltd.: Chichester, UK. Available at: <http://www.mrw.interscience.wiley.com/cochrane/clsysrev/articles/CD000032/frame.html> (accessed Apr 2005).
20. Bhutta ZA, Gupta I, de'Silva H, Manandhar D, Awasthi S, Hossain SM, Salam MA. Maternal and child health: is South Asia ready for change? *BMJ*, **328**(7443): 816-9, 2004.
21. Veena SR, Kumaran K, Swarnagowri MN, Jayakumar MN, Leary SD, Stein CE, Cox VA, Fall CH. Intergenerational effects on size at birth in South India. *Paediatr Perinat Epidemiol*, **18**: 361-70, 2004.
22. Fall CH, Yajnik CS, Rao S, Davies AA, Brown N, Farrant HJ. Micronutrients and fetal growth. *J Nutr*, **133**(5 Suppl 2): 1747S-1756S, 2003.
23. Abraham R, Brown MC, North WR, McFadyen IR. Diets of Asian pregnant women in Harrow: iron and vitamins. *Hum Nutr Appl Nutr*, **41**: 164-73, 1987.
24. Bernstein PS, Divon MY. Etiologies of fetal growth restriction. *Clin Obstet Gynecol*, **40**: 723-9, 1997.
25. Miller E, Nicoll A, Rousseau SA, Sequeira PJ, Hambling MH, Smithells R W, Holzel H. Congenital rubella in babies of south Asian women in England and Wales: an excess and its causes. *Br Med J (Clin Res Ed)*, **294**(6574): 737-9, 1987.
26. Ogunyemi D, Hullett S, Leeper J, Risk A. Prepregnancy body mass index, weight gain during pregnancy, and perinatal outcome in a rural black population. *J Matern Fetal Med*, **7**: 190-3, 1998.
27. Schieve LA, Cogswell ME, Scanlon KS, Perry G, Ferre C, Blackmore-Prince C, Yu SM, Rosenberg D. Prepregnancy body mass index and pregnancy weight gain: associations with preterm delivery. The NMIHS Collaborative Study Group. *Obstet Gynecol*, **96**: 194-200, 2000.
28. Yajnik CS, Fall CH, Coyaji KJ, Hirve SS, Rao S, Barker DJ, Joglekar C, Kellingray S. Neonatal anthropometry: the thin-fat Indian baby. The Pune Maternal Nutrition Study. *Int J Obes Relat Metab Disord*, **27**: 173-80, 2003.
29. Horta BL, Victora CG, Menezes AM, Halpern R, Barros FC. Low birthweight, preterm births and intrauterine growth retardation in relation to maternal smoking. *Paediatr Perinat Epidemiol*, **11**: 140-51, 1997.
30. Bell R, Lumley J. Low birthweight and socioeconomic status, Victoria 1982 to 1986. *Aust J Public Health*, **16**: 15-9, 1992.
31. Foster HW, Wu L, Bracken MB, Semanya K, Thomas J. Intergenerational effects of high socioeconomic status on low birthweight and preterm birth in African Americans. *J Natl Med Assoc*, **92**: 213-21, 2000.
32. Wilkinson R, Marmot M, Social Determinants of Health: The Solid Facts. World Health Organization. 2003. Available at: <http://www.who.dk/document/E81384.pdf> (accessed Apr 2005).
33. Department of Health. Research Findings Electronic Register (ReFeR). Are perinatal infant mortality rates improved for second generation Pakistani mothers? 2001. Avail-

- able at : http://www.info.doh.gov.uk/doh/refr_web.nsf/be85a308d62c8275802567df00-3764a7?CreateDocument (accessed Apr 2005).
34. Singh D. Government to overhaul mental health services for ethnic minorities. *BMJ*, **327**(7421): 950, 2003.
 35. Department of Health. National Service Framework for Children, Young People and Maternity Services. 2004. Available at : <http://www.dh.gov.uk/assetRoot/04/10/40/33/04104033.pdf> (accessed Apr 2005).
 36. Department of Health. Choosing Health : making healthier choices easier. 2004. Available at : http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4094550&chk=aN5Cor (accessed Apr 2005).
 37. NHS Centre for Reviews and Dissemination SPRU, University of York. Ethnicity and Health : reviews of literature and guidance for purchasers in areas of cardiovascular disease, mental health and haemoglobinopathies. 1996.
 38. National Health and Medical Research Council AG, Aboriginal and Torres Strait Islander Research *A Healthy Start to Life* Policy Framework. 2002. Available at : <http://www.nhmrc.gov.au/funding/fwork.pdf> (accessed Apr 2005).