Why do British Indian children have an apparent mental health advantage?

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Abstract

Background: Previous studies document a mental health advantage in British Indian children, particularly for externalising problems. The causes of this advantage are unknown.

Methods: Subjects were 13 836 White children and 361 Indian children aged 5-16 years from the English subsample of the British Child and Adolescent Mental Health Surveys. The primary mental health outcome was the parent Strengths and Difficulties Questionnaire (SDQ). Mental health was also assessed using the teacher and child SDQs; diagnostic interviews with parents, teachers and children; and multi-informant clinician-rated diagnoses. Multiple child, family, school and area factors were examined as possible mediators or confounders in explaining observed ethnic differences.

Results: Indian children had a large advantage for externalising problems and disorders, and little or no difference for internalising problems and disorders. This was observed across all mental health outcomes, including teacher-reported and diagnostic interview measures. Detailed psychometric analyses provided no suggestion of information bias. The Indian advantage for externalising problems was partly mediated by Indian children being more likely to live in two-parent families and less likely to have academic difficulties. Yet after adjusting for these and all other covariates, the unexplained Indian advantage only reduced by about a quarter (from 1.08 to 0.71 parent SDQ points) and remained highly significant (p<0.001). This Indian advantage was largely confined to families of low socio-economic position.

Conclusion: The Indian mental health advantage is real and is specific to externalising problems. Family type and academic abilities mediate part of the advantage, but most is not explained by major risk factors. Likewise unexplained is the absence in Indian children of a socio-economic gradient in mental health. Further investigation of the Indian advantage may yield insights into novel ways to promote child mental health and child mental health equity in all ethnic groups.

Keywords: Cross-cultural comparison, British Indians, advantaged groups, information bias, minority ethnic mental health, externalising problems. **Abbreviations:** B-CAMHS=British Child and Adolescent Mental Health Surveys; DAWBA=Development and Well-Being Assessment; OR=odds ratio; SDQ=Strengths and Difficulties Questionnaire; SEP=socio-economic position.

KEY POINTS
- British Indian 5-16 year olds have far fewer externalising problems and disorders than British Whites, but little or no difference for internalising problems.
- This pattern is reported by parents, teachers and children alike on both questionnaire and diagnostic interview measures, providing evidence against information bias; detailed psychometric analyses provide further evidence against bias.
- Family type and academic abilities mediate part of this Indian advantage, but most is not explained by major risk factors.
- Indian children do not show the marked socio-economic gradient in externalising problems which is observed in Whites.
- Understanding the Indian advantage may suggest novel ways to promote child mental health and child mental health equity.

Introduction

When seeking to improve the health of a population, investigating why some groups have a mental health advantage may provide valuable insights (Patel & Goodman, 2007). British Indian (henceforth 'Indian') children may be one such advantaged group. A recent systematic review found fairly consistent evidence of lower rates of common child mental health problems in Indian children, particularly for externalising problems (A. Goodman, Patel, & Leon, 2008).

Yet while previous studies report fewer problems in Indian children, none examines whether this reflects a real health difference. One important alternative is that the apparent Indian advantage reflects information bias due to systematic reporting differences across ethnic groups. Such cross-cultural differences have been suggested in comparisons across countries (e.g. Heiervang, Goodman, & Goodman, 2008) or between ethnic groups in Britain (e.g. Sonuga-Barke, Minocha, Taylor, & Sandberg, 1993). These issues are central to interpreting observed ethnic differences, but are rarely examined (A. Goodman, et al., 2008).

Moreover, all previous studies are largely descriptive – none make a detailed attempt to *explain* the Indian advantage. This is a major limitation because ethnicity is a non-homogenous construct, encompassing both personal ethnic identity but also structural factors such as socio-economic position (SEP) or societal racism (Nazroo, 1998). Observed ethnic differences should therefore be a starting point for further investigations of causal mechanisms. Such investigations need to measure potential mediators and confounders directly and to pay particular attention to adjusting for SEP, given the large ethnic differences in how SEP indicators are inter-related (Modood, et al., 1997)

This paper therefore uses two large British surveys which have previously documented a lower prevalence of 'any mental disorder' in Indians in univariable analyses (Green, McGinnity, Meltzer, Ford, & Goodman, 2005; Meltzer, Gatward, Goodman, & Ford, 2000). We examine how far this apparent Indian mental health advantage reflects a real health difference and, if so, what explains that difference. Specifically we examine:
1) Is there evidence of poor construct validity or information bias in the mental health measures collected in Indians?
2) Is the Indian mental health advantage consistently reported across informants and across mental health measures?
3) Can any real Indian advantage be explained by the child, family, school and area characteristics of the Indian children in the surveys?

This represents the first detailed investigation of these questions, and also the most comprehensive analysis to date of any ethnic difference in child mental health in Britain. In addressing these questions, we focus upon the comparison of Indians with White children because Whites are the ethnic group about whom most is already known. Whites are also the only ethnic group larger than Indians, making this the best-powered contrast possible.

Methods

Sample

The British Child and Adolescent Mental Health Surveys (B-CAMHS) of 1999 and 2004 were two nationally-representative surveys conducted in England, Scotland and Wales (Green, McGinnity, Meltzer, Ford, & Goodman, 2005; Meltzer, Gatward, Goodman, & Ford, 2000). Children were sampled from 5-15 years in 1999 and 5-16 years in 2004, using the Child Benefit Register as a sampling frame and with clustered sampling via postal sector. The primary caregivers ('parents') of selected children were approached to give written informed consent for face-to-face interview. With parental permission, the child's teacher and children aged 11 or over were also approached.

As the Scottish and Welsh samples contained only six Indian children, we restrict our analyses to children from England. Between the two B-CAMHS surveys, 22 916 English children were selected and 15 823 (69.0%) participated, including 13 936 White and 413 Indian children. Of these, 13 868 White and 361 Indian children had complete data for our primary outcome, the parent Strengths and Difficulties Questionnaire completed in English. These children form the study population for this paper. The White children were 50.8% male with a mean age of 10.2 years; their Indian counterparts were 52.5% male with a mean of 10.3 years. As for their parents, 94.5% of White parent informants were mothers, 4.3% fathers and 1.2% other informants. Among the Indian parents, 82.5% were mothers and 17.5% fathers.

B-CAMHS received ethical approval from the Research Ethics Committee of the Institute of Psychiatry, King's College London, and the national Multi-Centre Research Ethics Committee for England, Scotland and Wales.

Parent-reported ethnicity

Parents report the child's ethnic group using questions from the UK census. In B-CAMHS 1999 the ethnicity question included the categories 'Indian' and 'White'. B-CAMHS 2004 retained 'Indian' as a single category but distinguished 'White British' (N=6787) and 'White Other' (N=134). To achieve comparability between the two surveys we combined these White groups for analysis. Our White comparison group is therefore largely but not wholly White British.

Mental health measures

Strengths and Difficulties Questionnaire

Participating parents, teachers and children completed the 25-item Strengths and Difficulties Questionnaire (SDQ: R. Goodman, 1997, 2001). The SDQ can be divided into ten 'internalising' items covering emotional and peer problems and ten 'externalising' items covering behavioural and hyperactivity problems (the remaining five items cover prosocial behaviour). Item response options are Not true, Somewhat true and Certainly true.

Parents in B-CAMHS had a choice of over 40 languages for completing the SDQ. Seventeen White parents (0.1%) and 42 Indian parents (10.2%) completed SDQs in non-English languages. Many of these translations have not been validated, however, and we therefore use only SDQs completed in English. We also excluded SDQs with missing subscale scores (<2% for all informants in both Indians and Whites).

DAWBA bands and clinical diagnoses

All participating parents, teachers and children were administered the Development and Well-being Assessment (DAWBA: R. Goodman, Ford, Richards, Gatward, & Meltzer, 2000). This is a semi-structured interview administered by lay interviewers to parents and children, with a briefer self-complete questionnaire for teachers. Interviews contain detailed fully-structured sections on all child emotional, behavioural and hyperactivity disorders. Computer algorithms can use these fully-structured sections to provide ordered categorical variables ('DAWBA bands') of the probability that a child had a given disorder. This paper uses eight DAWBA bands: the emotional, behavioural and hyperactivity parent DAWBA bands; the emotional, behavioural and hyperactivity teacher DAWBA bands; and the emotional and behavioural child DAWBA bands (the child DAWBA contains no hyperactivity section).

The fully-structured sections of the DAWBA are followed by open-ended questions where respondents are prompted to describe problem areas. Experienced clinicians then use the closed and open responses from all three informants to assign diagnoses according to the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV: American Psychiatric Association, 1994). These diagnoses have been shown to have good reliability and validity in British samples (Ford, Goodman, & Meltzer, 2003; R. Goodman, et al., 2000).

Covariates and conceptual model

Box 1 summarises our 46 covariates and how we conceptualise these as relating to ethnicity. Level 1 of our model consists of the most distal variables, namely area characteristics, school characteristics and family SEP. These correspond conceptually to traditional epidemiological confounders and capture social/structural aspects of ethnicity. By contrast, Level 2 and Level 3 capture personal ethnic identity, reflecting potentially distinctive ways of thinking and behaving. We hypothesised that these might mediate some or all of the Indian advantage.

Box 1: Child, family, school and area variables assessed

Exposure of interest	**Ethnicity** [P] Indian vs. White
A priori confounders	[P] Child's age [P*] Child's gender [I] Survey year (1999 vs. 2004)
Level 1: area characteristics, school characteristics and family SEP	*Area characteristics* [I] Geographical region: North East; North West; Yorkshire & Humberside; East Midlands; West Midlands; East Anglia; London; South East; South West. [I] Metropolitan vs. non-metropolitan region [I*] Small area deprivation, from the 2004 English Indices of Multiple Deprivation (Noble, et al., 2004). *School characteristics* [I*] Ford Score, a predictor of the prevalence of mental health problems in a school (A. Goodman & Ford, 2008). *Family SEP* [P] Responding parent's highest educational qualification: no qualifications [coded 1]; poor GCSEs (grades D-F) or equivalent [2]; good GCSEs (grades A-C) [3]; A-level [4]; diploma [5]; degree [6]. [P] Weekly household income: £0-99 [coded 0.5]; £100-199 [1.5]; £200-299 [2.5]; £300-399 [3.5]; £400-499 [4.5]; £500-599 [5.5]; £600-769 [6.85]; £770 or over [8.5]. [P] Housing tenure: owner occupied; social sector rented; privately rented. [P] Occupational social class: I; II; III Non-manual; III Manual; IV; V; Never worked; Full-time student.† [P] Mother's economic activity: full time employed; part-time employed; looking after home and family; unemployed; other. [P] Father's economic activity: as for mother's economic activity
Level 2: Family composition and family stress	*Family composition* [P] Family type: two-parent; stepfamily; lone parent family [P] Parents married vs. cohabiting [P] Three-generation household: grandparent present vs. no grandparent present [P] Number of co-resident siblings [P*] Mother's age at child's birth *Family stress* [P*] Parent's mental health, from the 12-item General Health Questionnaire (GHQ-12: Goldberg & Williams, 1998).† [P*] Family functioning, from the general functioning subscale of the McMaster Family Activity Device (Miller, Epstein, Bishop, & Keitner, 1985).† [P] Family ever experienced parental separation : yes/no [P] Family ever experienced financial crisis: yes/no [P] Family member (not the child) ever had police contact: yes/no [P] Family ever experienced the death of a parent or sibling of the child: yes/no
Level 3: Child characteristics	*Physical disorders†* [P] Neuro-developmental disorder: yes/no [P] Developmental problems or immaturity: yes/no [P] Common physical health disorder: yes/no [P] Rare physical health disorder: yes/no *Stressful life events to child* [P] Child ever experienced serious illness requiring hospitalisation: yes/no [P] Child ever experienced death of a friend: yes/no

	Substance use† [C] Regular smoking (≥1 cigarette a week): yes/no. [C] Frequency of alcohol consumption: less than once a fortnight; once a fortnight to once a week; twice a week or more. [C] Ever used illegal drugs: yes/no *Academic abilities and difficulties* [T*] Teacher-reported academic difficulties (range 0-9), created by summing the teacher's response to question on the child's ability in 1) maths, 2) reading 3) spelling. Each question had response options above average [coded 0]; average [1]; some difficulty [2]; or marked difficulty [3]. [P] Parent-reported learning difficulties: yes/no [P] Parent-reported dyslexia: yes/no [A*] Formal tests of reading ability, from the British Ability Scales, second edition (Elliott, Smith, & McCulloch, 1996); B-CAMHS 1999 only [A*] Formal tests of spelling ability, measured as for reading ability; B-CAMHS 1999 only *Parent reward and punishment behaviours; B-CAMHS 1999 only* [P] Frequency of praising child: never; seldom; sometimes; often. [P] Frequency of non-physical punishment: never; seldom; sometimes; often. [P] Frequency of smacking child: never; seldom; sometimes; often. [P] Ever hits or shakes the child: yes/no *Relationships with relatives; B-CAMHS 2004, 11-16 year olds only* [C*] Perceived social support (range 0-14), using seven questions from the 1985 Health and Lifestyle Survey (Cox, et al., 1987).† [C] Number of close relatives inside the home [C] Number of close relatives outside the home [C] How often child helps relatives: under once a month; once a month; once a week; daily.
Outcomes	**Externalising problems** [P] Parent externalising SDQ score [T] Teacher externalising SDQ score

[P]=parent-reported; [T]=teacher-reported; [C]=child-reported; [A]=formal assessment; [I]=investigator-assigned.
*=continuous variables. †=Further information in Electronic Appendix

A priori interactions

In B-CAMHS 1999, a marked SEP gradient in reading ability was observed in Whites but not in Indians (Maugham, 2005). We therefore tested for interactions between Indian ethnicity and area deprivation/family SEP to examine if this also applied to child mental health. We also tested for interactions with family type or living in three-generation households. We believed the circumstances surrounding different family compositions might differ by ethnic group, and therefore so too might the implications for child mental health. Moreover, family type has been shown to interact with ethnicity in predicting adult mental health in Britain (Nazroo, 1997).

Statistical methods

We conducted all data analysis using Stata 10.1, except the factor analyses which were performed in MPlus5. All analyses adjusted for the complex B-CAMHS survey design.

Factor analyses

We have previously demonstrated that the two-factor general-specific model shown in Figure 1 shows good fit to the parent, teacher and child SDQ data in the total B-CAMHS sample (A. Goodman, 2009). In this paper we used a multi-group confirmatory factor analysis (Brown, 2006) to test whether this factor structure was the same (invariant) across Indians and Whites. We performed the confirmatory factor analyses using a multivariate probit analysis with the extension for ordinal data (Muthen, 1984) and estimating model fit using the Weighted Least Squares, mean and variance adjusted estimator. We follow common practice in reporting multiple indices of fit. To consider a model as showing acceptable fit, we required a Comparative Fit Index >0.90; a Tucker Lewis Index >0.90; and a Root Mean Square Error of Approximation <0.08 (Brown, 2006).

Comparing the SDQ with the DAWBA bands

We fitted a series of regression models with the internalising and externalising SDQ subscales as explanatory variables and the DAWBA bands from that same informant as an outcome (e.g. the parent SDQ to the parent DAWBA bands). We did this for the combined Indian and White sample, testing for interactions between ethnicity and 1) the internalising or 2) the externalising subscale. We thereby examined whether, for a given number of SDQ symptoms, Indians and White informants went on to report different levels of symptoms and impact in the DAWBA. If so, this would suggest a possible reporting bias on the SDQ. The underlying assumption is that although not a perfect 'gold standard', the far more numerous and more detailed DAWBA questions are less prone to bias than the brief SDQ (Heiervang, et al., 2008).

Multiple imputation for missing covariates

Some covariate data was missing systematically because it was only collected in one survey or because the teacher or child did not participate. Otherwise missing data was usually <1% and almost always <5%. We used multiple imputation (five imputations) to impute missing covariate values under an assumption of missing at random, using the MICE command in Stata10.1. When using covariates collected in only one survey, we restricted our analyses to that survey (e.g. B-CAMHS 1999 only).

Explaining the Indian advantage

To identify mediating or confounding variables which were important in explaining the Indian mental health advantage, we first fitted linear regression models with mental health (parent and teacher SDQ) as the outcome and with ethnicity, age, gender, survey year as explanatory variables. We then recorded how much the regression coefficient for White vs. Indian ethnicity changed after additionally adjusting for each covariate in turn. We treated most covariates as categorical variables, but used linear terms for the continuous variables (marked in Box 1). We interpreted movement towards the null (zero) in this ethnicity regression coefficient as meaning that the variable 'explained' some of the observed Indian advantage. We interpreted movement away from the null as the 'unmasking' of an even greater unexplained ethnic difference.

After examining these individual covariate effects, we fitted multivariable models adjusting for multiple variables simultaneously. First we entered variables with the largest individual effects in reducing the ethnicity regression coefficient. This represented an extreme case model showing

how much of the Indian advantage was explained when adjusting only for variables which moved this advantage towards zero. We then entered variables with small individual effects (operationalised as changing the regression coefficient by <0.15) and finally variables which increased the regression coefficient by >0.15.

Results

Comparability of mental health measures across Indians and Whites

Indians made up 2.6% of the English B-CAMHS sample, similar to the figure of 2.4% in the 2001 census (National Statistics, 2003). In multi-group confirmatory factor analyses, the two-factor general-specific model shown in Figure 1 provided acceptable fit to the parent, teacher and child SDQs (Comparative Fit Index/Tucker Lewis Index>0.94, Root Mean Square Error of Approximation<0.06; Table 1). This provides evidence of measurement invariance with respect to ethnicity – i.e. that the loadings, thresholds and residual errors of each SDQ item are the same for Indians and Whites, and furthermore that these symptoms correspond to latent traits matching the hypothesised internalising and externalising constructs. This was also borne out by two-factor exploratory factor analyses imposing no prior structure upon the 20 items (see Electronic appendix).

Figure 1: Two-factor general-specific model used in multi-group confirmatory factor analyses of the SDQ
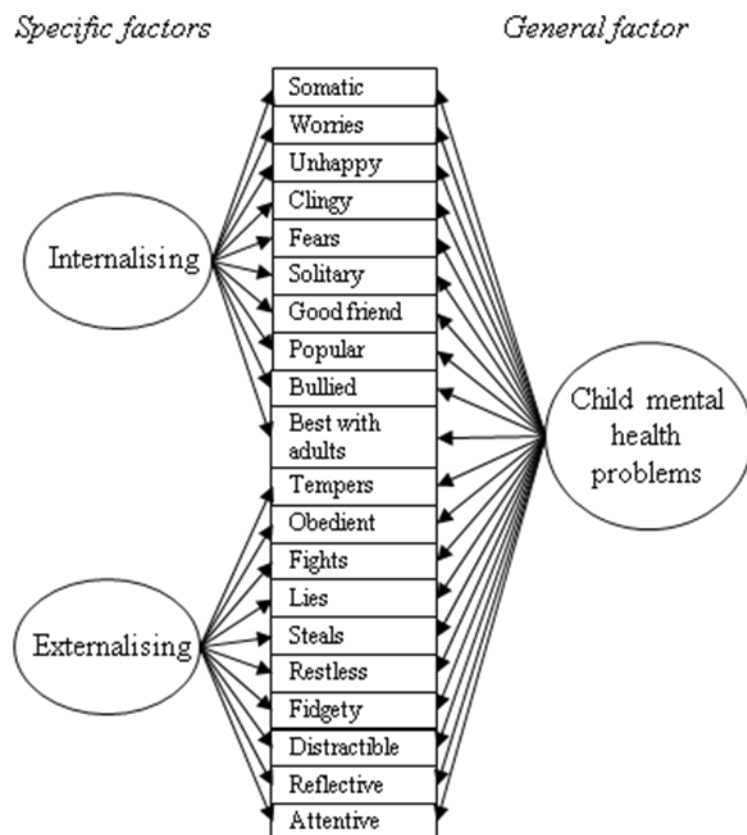
Table 1: Multi-group confirmatory factor analyses assessing measurement invariance between Indians and Whites, for the two-factor general-specific model displayed in Figure 1

Model	SDQ informant	N	Comparative Fit Index	Tucker Lewis Index	Root Mean Square Error of Approximation
Two-factor; general- specific model; see Figure 1	Parent	13 868 Whites, 361 Indian	0.963	0.956	0.054
	Teacher	10 775 Whites, 257 Indians	0.987	0.985	0.056
	Child	5776 Whites, 156 Indians	0.958	0.946	0.047

There was also no evidence that Indians systematically over- or under-reported SDQ symptoms. Rather the Indian and White SDQ subscales generally had very similar odds ratios in ordered logistic regression models predicting to the DAWBA bands (see Figure 2). In only 1 of the 16 tests for interaction (eight DAWBA bands times two SDQ subscales) was there evidence ($p<0.05$) of an interaction between ethnicity and SDQ score. This interaction reflected an unexpected U-shape association between the parent internalising subscale and the parent behavioural DAWBA band in Indians ($p=0.003$; see Figure 2), but in the context of multiple testing is likely to be a chance finding.

Figure 2: Parent SDQ subscales as predictors of the parent DAWBA bands
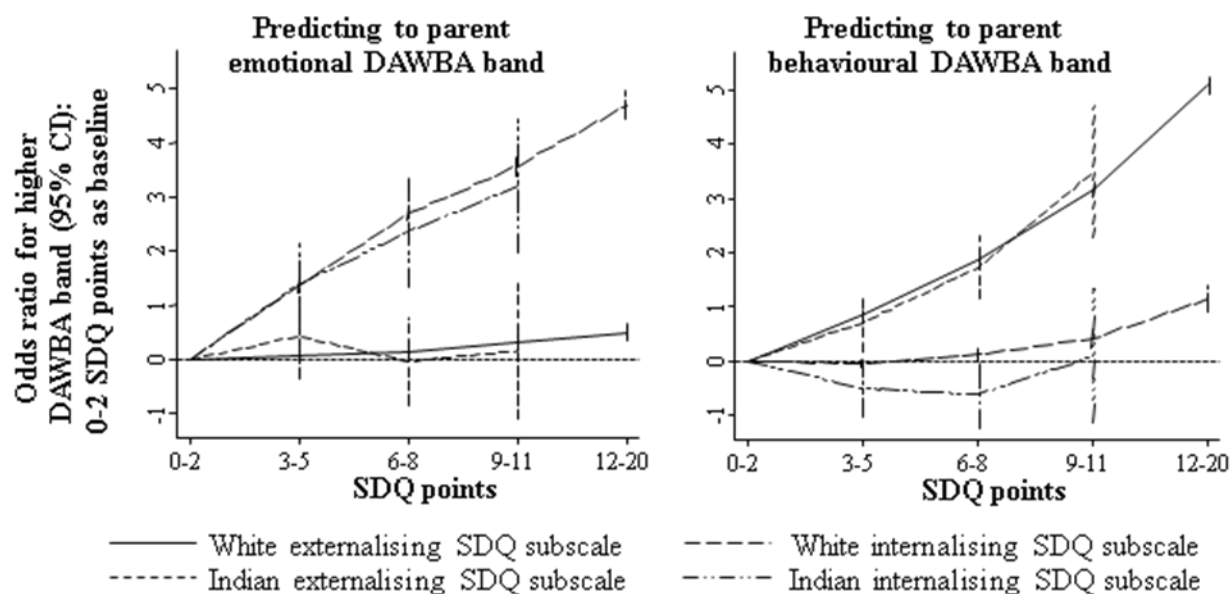
Results not presented for points based on five or fewer children. Results not presented for the parent hyperactivity, which failed to converge because almost all Indians (N=345/362) were in Level 0 or 1.

In summary, these psychometric analyses indicated that the internalising and externalising SDQ subscales had good construct validity in both Indians and Whites, and provided no evidence of ethnic reporting bias.

Consistency of the Indian advantage

In Indians the estimated prevalence of any mental disorder was 3.7% (95%CI 2.1%, 6.4%), substantially lower than the Whites prevalence of 10.0% (95%CI 9.4%, 10.5%). This difference was driven by Whites having more behavioural or hyperactivity disorders; for emotional disorders there was no evidence of a difference between the two groups (Table 2).

The same pattern was observed for the parent, teacher and child SDQ scores (Table 2) and the parent, teacher and child DAWBA bands (see Electronic appendix). For the measures of behavioural/hyperactivity/externalising problems there was always strong evidence of an Indian advantage (usually p<0.001). This advantage reflected a shift to the left of the whole distribution of externalising scores, with more children receiving low scores and fewer receiving high scores. The magnitude of this shift was large, only slightly smaller than the difference between boys and girls – for example, on the parent SDQ the ethnic differences was 1.08 SDQ points and the gender difference 1.38 points. By contrast, there was little or no evidence of an ethnic difference for emotional/internalising problems (p≥0.05).

Stratified analyses indicated that these findings applied at all ages and for both boys and girls, with no evidence of an interaction between ethnicity and age or gender. The same was true after stratifying by mother vs. father for parent informant type; in all strata Indians continued to have a large advantage for externalising problems and little or no difference for internalising problems. The higher proportion of father informants among Indians therefore could not explain the observed Indian advantage.

Table 2: Disorder prevalence (clinician-rated DAWBA) and parent, teacher and child SDQ scores for Indians and Whites types

		White prevalence	Indian prevalence	Odds ratio & 95%CI for White vs. Indian ethnicity
Clinician-rated DAWBA diagnosis (13 868 White, 361 Indian)	**Any mental disorder**	10.0	3.7	2.97 (1.65, 5.34)***
	Emotional disorder	4.1	2.3	1.86 (0.89, 3.89)
	Behavioural disorder	5.3	1.4	3.98 (1.70, 9.34)**
	Hyperactivity disorder	2.4	0.3	8.46 (1.18, 60.56)*
		White mean	Indian mean	Regression coefficient & 95%CI for White vs. Indian ethnicity
Parent SDQ (13 868 White, 361 Indian)	**Total difficulty score**	8.31	7.44	0.87 (0.13, 1.61)*
	Internalising problems	3.33	3.54	-0.21 (-0.67, 0.25)
	Externalising problems	4.98	3.90	1.08 (0.73, 1.43)***
Teacher SDQ (10 775 White, 257 Indian)	**Total difficulty score**	6.55	5.25	1.35 (0.58, 2.11)**
	Internalising problems	2.85	2.56	0.30 (-0.20, 0.80)
	Externalising problems	3.70	2.69	1.05 (0.67, 1.43) ***
Child SDQ (5776 White, 156 Indian)	**Total difficulty score**	10.36	9.05	1.34 (0.49, 2.19)**
	Internalising problems	4.27	4.13	0.12 (-0.36, 0.59)
	Externalising problems	6.08	4.92	1.22 (0.69, 1.76)***

*p<0.05, **p<0.01, ***p<0.001. Odds ratios/regression coefficients generated through logistic/linear regression, adjusting for age, gender and survey year.

Explaining the Indian advantage

Predictors of child externalising problems

Most variables in our conceptual model showed strong evidence of univariable associations with parent externalising SDQ scores (p<0.001). The exceptions were geographical region, metropolitan region, three-generation household and how often the child helped relatives; these four variables showed no evidence of an association (p>0.05).

Characteristics of Indians and Whites

Table 3 summarises the characteristics of Indians and Whites for selected variables. Full results are presented in the Electronic appendix, including externalising scores for each level. The Appendix also gives further details of the key findings summarised below.

Table 3: Indian and White participants for selected characteristics

Domain	Variable	Range/categories (see Appendix for numbers in each level)	White percent or mean	Indian percent or mean	*P* for ethnic difference
A priori confounders	Child's sex	Male	50.8	52.5	0.54(x)
		Female	49.2	47.6	
	Child's age	Range 5-16 years	m=10.2	m=10.3	0.29(z)
Family SEP	Parent's highest educational qualification	No qualifications	19.8	28.3	<0.001(x)
		Poor GCSEs	14.9	17.7	
		Good GCSEs	31.3	18.9	
		A-level	10.7	6.8	
		Diploma	10.8	9.7	
		Degree	12.5	18.6	
	Housing tenure	Owner occupied	71.0	88.7	<0.001(x)
		Social sector rented	22.5	7.7	
		Privately rented	6.5	3.6	
Family composition	Family type	Two-parent family	65.4	92.2	<0.001(x)
		Step family	12.1	1.1	
		Lone parent family	22.4	6.7	
Family stress	Family functioning	Range 1-3.75 points	m=1.69	m=1.80	<0.001(z)
Child	Teacher- reported academic difficulties	Range 0-9 points	m=3.03	m=2.71	0.05(z)
	Parent-reported learning difficulty	No	91.4	97.1	<0.001(x)
		Yes	8.6	2.9	
	Parent-reported dyslexia	No	96.4	99.5	<0.001 (x)
		Yes	3.6	0.5	
Child, B-CAMHS 1999 only	Formal reading ability	Range -3.1 s.d. to +2.7 s.d. from average	m=0.00	m=0.13	0.24(y)
	Formal spelling ability	Range -3.5 s.d. to +3.1 s.d. from average	m=0.00	m=0.32	0.001(y)

(x)=chi-squared test for association; (y)=T-test (normally distributed continuous variables); (z)=Wilcoxon non-parametric test (non-normal continuous variables). Details on all covariates presented in the Electronic Appendix.

Many child, family, school and area characteristics showed major differences between Indians and Whites. Among the Level 1 variables, Indians were systematically disadvantaged for area deprivation, advantaged for housing tenure, concentrated at the extremes of the distribution for parent education, and similar for occupational social class and income. Further analyses revealed that household income, parent education and social class had a very similar relationship to each other in Indians and Whites. By contrast, the proportion of Indian and White home-owners was very similar in the most advantaged groups, but the steep SEP gradient in Whites was not observed in Indians. Indians also lived in more deprived areas at any given level of parent education, household income or occupational social class.

Among the Level 2 variables, two-parent families were substantially more common in Indians and less socio-economically differentiated. Indian families were also more likely to have a grandparent in the household. Most other family variables showed modest differences, with the exception of strong evidence of worse parent-reported family functioning in Indian families. This was unexpected, but further analyses revealed no evidence that the family functioning scale was an inappropriate or biased measure in Indians (see Electronic appendix).

Finally, Indian parents reported a lower prevalence of learning difficulties and dyslexia in their children. This was supported by evidence of Indians having fewer academic difficulties by teacher report and also doing better on the formal assessment of spelling (although not reading).

Key mediating and confounding variables: univariable analyses

As reported in Table 2, the ethnicity regression coefficient for the parent externalising score was 1.08 (95%CI 0.73, 1.43) after adjusting for age, gender and survey year. That is, the parent externalising score of Whites was an average of 1.08 SDQ points higher (less favourable) than Indians, corresponding to 0.28 standard deviations. The corresponding coefficient for teacher scores was 1.05 (95%CI 0.67, 1.43) or 0.26 standard deviations.

Figure 3 summarises how the parent regression coefficient changed after additionally adjusting for each covariate in turn. Large reductions in the regression coefficient (points on the left of the Figure) indicate variables which reduce the unexplained difference between Indians and Whites – that is, 'explaining' some of the Indian mental health advantage. Large increases in the regression coefficient (points on the right) indicate variables which increase the unexplained difference between Indians and Whites – that is, 'unmasking' an even greater Indian advantage. Points between the dotted lines indicate variables which we classified as having small individuals effects.

Figure 3: Change in the Indian (vs. White) regression coefficient for the parent externalising score after adjusting for each child, family, school and area characteristic in turn

Sex (+0.02)
Age (-0.01)
Survey year (-0.01)
Geographical region (0.00)
Metropolitan region (+0.01)
Area deprivation (+0.30)
Ford score (+0.07)
Parent's education (+0.09)
Household income (+0.09)
Housing tenure (-0.35)
Occupational social class (-0.07)
Mother's economic activity (+0.12)
Father's economic activity (+0.08)
●ALL LEVEL 1 (-0.09)
Family type (-0.43)
Marital status (-0.15)
Three generation family (+0.05)
No. co-resident siblings (+0.04)
Mother's age at child's birth (0.00)
Parent mental health (+0.01)
Family functioning (+0.26)
Parental separation (-0.36)
Family financial crisis (-0.03)
Family police contact (-0.06)
Death of parent/sibling (-0.01)
●ALL LEVEL 2 (0.00)
Neuro-developmental disorder (-0.02)
Developmental problems (-0.13)
Common physical disorder (-0.05)
Rare physical disorder (-0.04)
Hospitalisation (-0.05)
Death of friend (-0.04)
Regular smoker (-0.08)
Alcohol consumption (-0.05)
Ever used drugs (-0.03)
Learning difficulty (-0.24)
Dyslexia (-0.07)
Teacher-reported academic difficulties (-0.19)
●ALL LEVEL 3 BOTH DATASETS (-0.44)
Formal test: reading (-0.15)
Formal test: spelling (-0.39)
Reward: praise (+0.26)
Punish: nonphysical punishment (-0.21)
Punish: smacking (+0.04)
Punish: ever hit or shake (+0.12)
Social support score (0.00)
No. close relatives in home (-0.01)
No. close relatives outside home (+0.04)
How often child helps relatives (+0.01)

-0.5   -0.4   -0.3   -0.2   -0.1   0   0.1   0.2   0.3   0.4   0.5

Change in regression coefficient for Indian (vs. White) parent externalising score after adjusting for each variable in turn

d.f. = degrees of freedom. Dotted lines at -0.15 and 0.15 correspond to the thresholds used to operationalise individual effects as 'small'.

Among the Level 1 variables, housing tenure had a large individual effect in reducing ('explaining') the ethnic difference and area disadvantage had a large effect in increasing ('unmasking' a difference. Yet because these variables show a very different relation to other SEP indicators in Indians compared to Whites, it is more meaningful to examine the effect of adjusting simultaneously for all Level 1 variables. In fact this only reduced the ethnicity regression coefficient slightly, suggesting that confounding by area, school and family SEP variables cannot explain the Indian advantage.

Among the Level 2 variables, family type and parental separation had the largest effects in reducing the Indian advantage, while adjusting for the poorer family functioning of Indian families increased the unexplained Indian advantage. Among the Level 3 variables, only the academic ability variables consistently reduced the Indian advantage. Otherwise, most child factors had modest effects or (for the rewards/punishments variables) had moderate effects but in opposite directions. All these results were very similar when repeated using the teacher SDQ (see Electronic Appendix).

Key mediating and confounding variables: multivariable analyses

Our univariable analyses guided the multivariable analyses reported in Table 4. Our starting point, in the top line of the Table, was the regression coefficient for the Indian advantage adjusted only for age, sex and survey year. We then adjusted for the variables which the univariable analyses suggested were important in explaining the Indian advantage, namely the academic abilities variables (line 2 of Table 4) and family type/parent divorce (line 3). Next we entered the variables with small individual effects, grouping these as Level 1, 2 and 3 variables according to our conceptual model. Finally we entered family functioning, as a variable which seemed to unmask an even greater Indian advantage. For each line we present the magnitude of the regression coefficient as a percentage of the starting value.

Adjusting for academic abilities decreased the Indian advantage by about a quarter. There was little further change (-0.05 parent SDQ points and +0.01 teacher SDQ points) upon also adjusting for the formal tests of reading and spelling in B-CAMHS 1999 subset. Additionally entering family type decreased the regression coefficient for the Indian advantage to half its initial value, but it remained highly significant at p≤0.004. Further adjustment for other Level 1, Level 2 and Level 3 variables had only modest additional effects, and adding family functioning increased the coefficient somewhat. The final fully-adjusted values in the full population of Indians and Whites was 0.71 SDQ points (95% 0.35, 1.08; p<0.001) for parent externalising scores and 0.62 SDQ points (95%CI 0.24, 1.00; p=0.001) for teacher scores.

The parent and teacher externalising scores thus yielded similar substantive findings: adjusting for family type and academic abilities decreased the ethnicity regression coefficient somewhat but most of the difference remained unexplained. This was also replicated when the outcome was the child SDQ externalising score or any externalising disorder (see Electronic appendix). By contrast, internalising problems or disorders showed little or no evidence of an ethnic difference in multivariable models, consistent with their similarity in univariable analyses.

Table 4: Ethnic differences in mean parent and teacher externalising SDQ score: adjusted regression coefficients for White vs. Indian ethnicity

Adjusted for:	Parent externalising score (13 868 White, 361 Indian)		Teacher externalising score (10 775 White, 257 Indian)	
	Adjusted regression coefficient for Indian vs. White ethnicity	Percent of initial value	Adjusted regression coefficient for Indian vs. White ethnicity	Percent of initial value
Sex, age and survey year	1.08 (0.73, 1.43)***	100%	1.05 (0.67, 1.43)***	100%
Plus academic abilities (teacher-reported academic difficulties, parent-reported learning difficulties, parent-reported dyslexia)	0.80 (0.46, 1.15)***	74%	0.78 (0.43, 1.12)***	74%
Plus family type and parental divorce	0.51 (0.17, 0.84)**	47%	0.52 (0.18, 0.87)**	50%
Plus Level 1 variables on area, school and family SEP (geographical region, metropolitan region, area deprivation, school quality, parent education, household income, housing tenure, social class)	0.60 (0.25, 0.94)**	56%	0.58 (0.21, 0.95)**	55%
Plus other Level 2 variables on family composition and stress (three-generation family, number of co-resident siblings, mother's age, parent mental health, family financial crisis, family police contact, death of parent/sibling)	0.69 (0.34, 1.04)***	64%	0.66 (0.28, 1.04)**	63%
Plus other Level 3 child variables (neuro-developmental disorder, developmental problems, common physical health disorder, rare physical health disorder, child hospitalisation, death of a friend, smoking, alcohol, drug use)	0.55 (0.19, 0.91)**	51%	0.57 (0.19, 0.95)**	54%
Plus family functioning	0.71 (0.35, 1.08)***	65%	0.62 (0.24, 1.00)**	59%

*p<0.05, **p<0.01, ***p<0.001.

Interactions with ethnicity

There was no evidence of an interaction between ethnicity and family type or three-generation family status (p≥0.17). By contrast, there was consistent evidence of an interaction between Indian ethnicity and area deprivation/family SEP. This was observed across all five measures in univariable analyses, and therefore could not be explained by ethnic differences in the inter-relationship between these SEP indicators. This interaction also persisted in fully-adjusted multivariable models, indicating that it was not explained by Indians' child, family, school and area characteristics.

In all cases the interaction was such that the deprivation/SEP gradient of externalising problems was less marked in Indians than in Whites. The result was that among the most privileged families the mental health of Indians and Whites was similar, with the Indian mental health advantage largely confined to families facing socio-economic adversity.

Figure 4 illustrates this for parent education; for full results see the Appendix.

Figure 4: Parent externalising scores for Indians and Whites by parent education

p-value for interaction <0.001 (1 d.f.) if linear
or 0.006 (5 d.f.) if categorical

p-value for interaction 0.006 (1 d.f.) if linear
or 0.03 (5 d.f.) if categorical
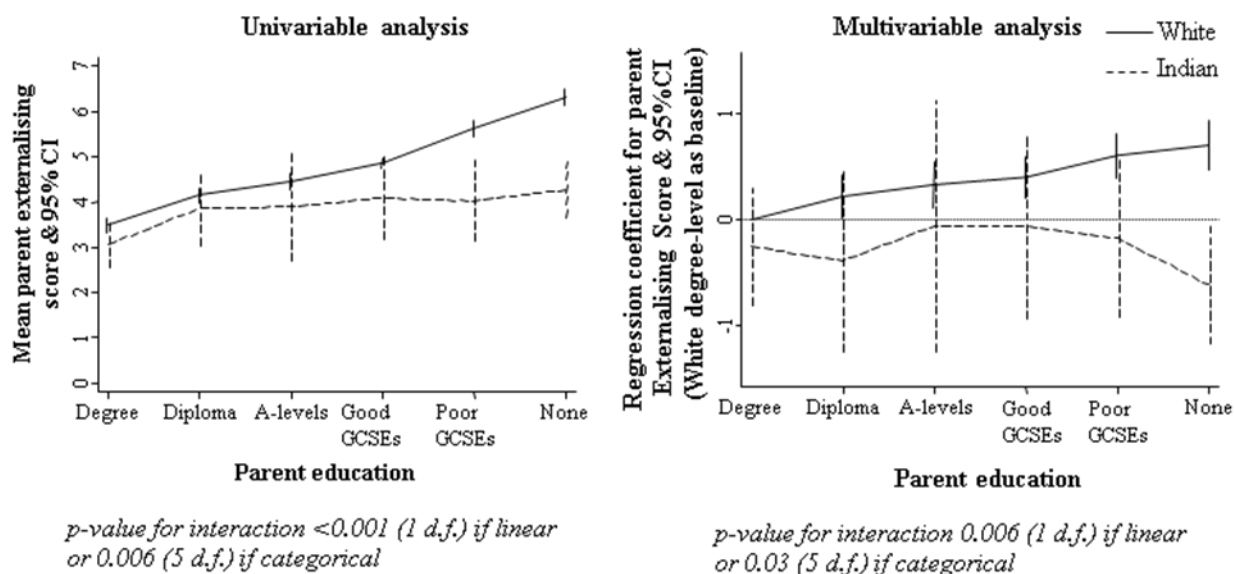
Discussion

This analysis of 13 868 White and 361 British Indian children aged 5-16 years provides strong evidence of a large Indian advantage for behavioural and hyperactivity problems. By contrast for emotional problems there was little or no evidence of difference. This pattern was observed with complete consistency across multi-informant clinical diagnoses; parent, teacher and child probability bands for disorder; and parent, teacher and child questionnaires (the SDQ). This consistency across outcomes and across informants provides important evidence that these measures provided valid and unbiased assessments, a conclusion supported by detailed psychometric analyses. As for why Indian have an advantage for externalising problems, a higher prevalence of two-parent families and higher academic abilities seemed to play some role. Yet even after adjusting for these and all the other covariates available, most of the Indian advantage remained unexplained. Likewise unexplained was the fact that the Indian advantage was particularly large in children from socially disadvantaged families. These results were replicated across parent-, teacher- and child-reported externalising scores and for externalising disorders, adding considerably to the confidence one can have in the findings.

The Indian advantage is confined externalising problems

These findings represent a major contribution to our understanding of child mental health in British Indians, Britain's largest minority ethnic group. First, our demonstration that the British Indian advantage is confined to externalising problems is important for several reasons. For researchers, it suggests that future comparisons should always analyse externalising problems separately from internalising/emotional problems. For practitioners, it suggests that an apparent 'under-representation' of Indian children with behavioural and hyperactivity disorders in mental health clinics does not necessarily reflect unmet need. Instead it may reflect genuinely lower prevalence.

By contrast, Indian children do not seem to have fewer internalising/emotional problems. Nevertheless, it is worth stressing that there was certainly no evidence of any Indian *dis*advantage for internalising problems. This is important because some authors have hypothesised that a high value upon obedience and respect in Indian culture means that children are implicitly encouraged to express difficulties through internalising not externalising behaviours (Atzaba-Poria & Pike, 2007; Ghuman, 1999). Our findings provide evidence against this 'redirection' model, suggesting that the Indian advantage for externalising problems is not part of a zero-sum game in which difficulties are merely diverted rather than prevented.

The Indian mental health advantage is real

Crucial to interpreting this Indian advantage for externalising problems is the evidence that this reflects a real health difference. One key strength of our study is its population-based sampling, which avoids biases from ethnic differences in clinic referral patterns (Messent & Murrell, 2003). Another is that unusually rich mental health assessments allowed us to triangulate findings across informants and across different measures; use factor analyses to evaluate the hypothesised mental health constructs in both groups; and examine whether questionnaire measures showed evidence of reporting bias when judged against diagnostic interviews. By contrast, few previous studies have made any attempt to address the issue of information bias (A. Goodman, et al., 2008). Many studies could apply at least some of these techniques, however, and we hope that demonstrating them in this paper will encourage this.

Explaining the Indian advantage for externalising problems

Externalising problems have increased in Britain in the past 30 years and predict substantial adverse affects across multiple life outcomes (Collishaw, Maughan, Goodman, & Pickles, 2004). Understanding why rates of externalising problems remain low in British Indian children is therefore of great public health interest. It could illuminate ethnic differences related to other important social issues, such as the low rate of criminal offending reported by Indians (Sharp & Budd, 2005).

That family type mediates some of the Indian mental health advantage is not surprising; two-parent families are well-documented to be associated with better child mental health (McMunn, Nazroo, Marmot, Boreham, & Goodman, 2001) and to be more common in Indians than Whites (White, 2002). Indian family composition is also distinctive for its high proportion of three-generation households, but this was not important in explaining their mental health advantage. This was because, contrary to one previous study of British Indians and Pakistanis (Sonuga-Barke & Mistry, 2000), there was no evidence of a protective effect of living in three-generation households.

The only further substantial contribution in explaining the Indian advantage was their lower prevalence of academic difficulties. This is intriguing given that many leading prevention initiatives, including SureStart and the Healthy Schools program, aim to foster good child mental health by enriching educational experience. Understanding the Indian education advantage could therefore clarify a mechanism for promoting child mental health which is of great political interest. Yet unfortunately, while the higher educational attainment of Indians is well-described (Department for Education and Skills, 2005), little is known about its causes. This is because

recent educational surveys either use meta-ethnic categories like 'Asian' (Peters, Seeds, Goldstein, & Coleman, 2007) or else oversampled only disadvantaged minority groups (Moon & Ivins, 2004).

We believe this exclusive focus upon minority ethnic problems is not justified, and that one key research question is why Indians have such high educational attainment. Another, related priority is investigating why this has a protective effect on mental health. Below-average academic ability is likely to have some direct effects (R. Goodman, Gledhill, & Ford, 2003), but may also partly be a marker for other protective parenting practices. Qualitative studies suggest these may include a strong cultural commitment to education and an emphasis upon respect and obedience towards adult authority figures (Dosanjh & Ghuman, 1996; Hackett & Hackett, 1994). These may have protective effects through pathways other than academic ability *per se*, such as increasing the congruence between expected behaviour at home and at school.

Understanding the Indian education advantage would therefore clarify an *identified* mechanism for the Indian mental health advantage and might also generate hypotheses regarding hitherto unidentified mechanisms. It might also shed light on the consistent and unexplained finding that the Indian advantage was particularly large in socio-economically disadvantaged families. We speculate that this may partly be explained by Indian families having a strong commitment to their child's education regardless of their SEP. This is consistent with the flattening of the Indian SEP gradient for reading ability previously described in B-CAMHS 1999 (Maugham, 2005). It also resonates with sociological accounts of an "adaptation of middle-class values towards education by working-class South Asians" (Abbas, 2002, p.304).

Even if this hypothesis proves incorrect, the observed SEP-ethnicity interaction is of great potential interest. That there is little or no difference between Indians and Whites in high SEP groups provides some evidence against the Indian advantage being caused by protective gene alleles or by highly culturally-specific values. Instead the advantage may reflect attitudes and behaviours which have the potential to exist across ethnic groups, but which in Whites are currently largely confined to high SEP families. Further investigation could shed light on why the mental health of White children *does* show a strong SEP gradient and suggest how that gradient could be reduced.

Limitations and directions for future research

Investigating whether this SEP interaction is replicated in other studies is therefore one research priority. Also valuable will be further qualitative and quantitative studies which investigate the causes of the Indian education advantage; test our hypotheses regarding the importance of attitudes towards education; and examine other factors not measured in B-CAMHS. Examining novel factors is necessary because most of the Indian mental health advantage remained unexplained after adjusting for the many mental health risk factors which B-CAMHS did assess. Strikingly, in none of the multivariable models did the Indian advantage reduce by more than half or become non-significant at the 1% level. This included extreme case models adjusting only for variables which decreased the unexplained Indian advantage.

Examining novel factors is also necessary because B-CAMHS lacked information on potentially important variables such as acculturation/assimilation, religion or religiosity. B-CAMHS also

lacked information which would permit examination of within-Indian heterogeneity (e.g. second vs. third generation children, or East African vs. non-East African migration to Britain). Finally, sample sizes for most ethnic groups were too small to allow detailed inter-ethnic contrasts. This prevented potentially informative contrasts with other groups who may have a mental health advantage (e.g. Black Africans (A. Goodman, et al., 2008)) and/or an education advantage (e.g. Chinese children (Department for Education and Skills, 2005)). Future studies oversampling these and other minority groups would have substantially greater scope for testing hypotheses using multi-ethnic comparisons.

Conclusion

British Indian children have a large advantage for externalising problems which cannot be explained by reporting bias. This advantage is partly mediated by family type and academic abilities, but most of the advantage is not explained by major risk factors. Likewise unexplained is the absence in Indian children of a socio-economic gradient in mental health. Greater understanding of these unexplained differences may help identify new ways to improve mental health and to promote mental health equity among children of all ethnicities.

Conflict of interest

None

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ELECTRONIC APPENDIX

Part 1: comparing Indians and whites for DAWBA bands

Table 5: Distribution of the parent, teacher and child DAWBA bands in Indian and White children

	DAWBA band	Parent				Teacher				Child			
		White (N=13 824)		Indian (N=359)		White (N=10 494)		Indian (N=258)		White (N=5713)		Indian (N=155)	
		N	Percent	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent
Any emotional disorder	**Levels 0 & 1**	10,361	74.9	286	79.4	9,223	87.9	228	88.2	4,029	70.5	122	78.6
	Level 2	2,229	16.1	51	14.4	452	4.3	15	5.8	954	16.8	13	8.5
	Level 3	817	5.9	17	4.9	684	6.5	14	5.6	543	9.5	14	9.1
	Levels 4 & 5	417	3.0	5	1.4	135	1.3	1	0.4	187	3.3	6	3.9
Any behavioural disorder	**Levels 0 & 1**	5,350	38.7	194	54.2	6,490	61.8	182	71.0	2 907	50.8	113	62.9
	Level 2	6,845	49.5	152	42.1	3,197	30.5	66	25.1	2 409	41.7	61	33.2
	Level 3	975	7.1	10	2.8	294	2.8	5	1.8	311	5.4	4	2.2
	Levels 4 & 5	654	4.7	3	0.9	513	4.9	5	2.0	123	2.1	3	1.8
Any hyperactivity disorder	**Levels 0 & 1**	12,002	86.8	342	95.3	8,356	79.7	219	85.2	–	–	–	–
	Level 2	844	6.1	12	3.2	1,137	10.8	23	8.7	–	–	–	–
	Level 3	702	5.1	4	1.2	800	7.6	14	5.4	–	–	–	–
	Levels 4 & 5	276	2.0	1	0.3	201	1.9	2	0.8	–	–	–	–

Note that there is no child DAWBA band for hyperactivity. Note percentages are calculated with adjustment for survey design, and so differ slightly in some cases from the values calculated based on the raw numbers of children.

Table 6: Proportional odds ratios for the Indian advantage by DAWBA bands

DAWBA band	Proportional OR for high DAWBA band in White vs. Indian children (95%CI)		
	Parent (N=14 183)	Teacher (N=10 752)	Child (N= 5868)
Any emotional disorder	1.30 (1.00, 1.70) [p=0.05]	1.07 (0.68, 1.69)	1.40 (0.88, 2.22)
Any behavioural disorder	1.98 (1.61, 2.43)	1.61 (1.21, 2.14)**	1.66 (1.20, 2.30)**
Any hyperactivity disorder	3.22 (2.07, 5.01)	1.54 (1.07, 2.21)*	–

*p<0.05, **p<0.01, ***p<0.001. OR generated through ordered logistic regression, adjusting for age, gender and survey year. Note that there is no child hyperactivity DAWBA band. As in Table 5, for each probability bands, we banded the lowest two levels (Level 0 and Level 1) and the highest two levels (Level 4 and Level 5) in order to avoid very small numbers in the Indian sample. In no case was there evidence at the 1% level that the proportional odds assumption was violated.

Part 2: factor analyses of the parent, teacher and child SDQs

Table 7: Two-factor exploratory factor analyses for Whites and Indians on the total difficulty items of the parent SDQ

Item	White (N= 13 868)		Indian (N=361)	
	"Internalising" factor	"Externalising" factor	"Internalising" factor	"Externalising" factor
Somatic [i]	**-0.44**		**-0.49**	
Worries [i]	**-0.78**		**-0.65**	
Unhappy [i]	**-0.75**		**-0.69**	
Clingy [i]	**-0.57**		**-0.66**	
Fears [i]	**-0.68**		**-0.75**	
Solitary [i]	**-0.52**		**-0.48**	
Good friend [i] *	**0.40**		**0.53**	
Popular [i] *	**0.45**		**0.50**	
Bullied [i]	**-0.55**		**-0.65**	
Best with adults [i]	**-0.45**		**-0.43**	
Tempers [e]		**-0.46**	-0.33	0.37
Obedient [e] *		**0.56**		**-0.41**
Fights [e]		**-0.53**		**0.43**
Lies [e]		**-0.56**		**0.44**
Steals [e]		**-0.56**		
Restless [e]		**-0.75**		**0.74**
Fidgety [e]		**-0.75**		**0.64**
Distractible [e]		**-0.81**		**0.68**
Reflective [e] *		**0.69**		**-0.55**
Persistent [e] *		**0.77**		**-0.58**

[i] indicates item hypothesised to lie on the internalising subscale, [e] on the externalising subscale. Items marked * are positively worded, and therefore expected to load in the reverse direction. Loadings over 0.3 presented, loadings over 0.4 presented in bold.

Table 8: Two-factor exploratory factor analyses for Whites and Indians on the teacher SDQ

Item	White (N= 10 775)		Indian (N=257)	
	"Internalising" factor	"Externalising" factor	"Internalising" factor	"Externalising" factor
Somatic [i]	**0.57**		**0.50**	
Worries [i]	**0.83**		**0.85**	
Unhappy [i]	**0.75**		**0.88**	
Clingy [i]	**0.76**		**0.70**	
Fears [i]	**0.90**		**0.77**	
Solitary [i]	**0.62**		**0.81**	
Good friend [i] *	**-0.48**	**0.41**	**-0.68**	
Popular [i] *	**-0.40**	**0.55**	**-0.52**	-0.36
Bullied [i]	**0.56**		**0.65**	
Best with adults [i]	**0.48**		**0.60**	
Tempers [e]		**0.68**		**0.40**
Obedient [e] *		**-0.75**		**-0.72**
Fights [e]		**0.79**		**0.78**
Lies [e]		**0.77**		**0.72**
Steals [e]		**0.64**		**0.52**
Restless [e]		**0.96**		**0.87**
Fidgety [e]		**0.95**		**0.87**
Distractible [e]		**0.90**		**0.91**
Reflective [e] *		**-0.82**		**-0.77**
Persistent [e] *		**-0.86**		**-0.89**

See notes to Table 7

Table 9: Two-factor exploratory factor analyses for Whites and Indians on the child SDQ

	White (N=5776)		Indian (N=156)	
Item	"Internalising" factor	"Externalising" factor	"Internalising" factor	"Externalising" factor
Somatic [i]	0.44		0.30	
Worries [i]	0.69		0.70	
Unhappy [i]	0.70		0.70	
Clingy [i]	0.51		0.52	
Fears [i]	0.67		0.67	
Solitary [i]	0.50		0.35	
Good friend [i] *			-0.32	
Popular [i] *				
Bullied [i]	0.60		0.82	
Best with adults [i]	0.39		0.36	
Tempers [e]		0.48		0.42
Obedient [e] *		-0.65		-0.73
Fights [e]		0.55	0.34	
Lies [e]		0.53	0.40	0.35
Steals [e]		0.49	-0.69	
Restless [e]		0.55		0.56
Fidgety [e]		0.58		0.56
Distractible [e]		0.65	-0.32	0.48
Reflective [e] *		-0.63		-0.61
Persistent [e] *		-0.68		-0.55

See notes to Table 7

A note on sample sizes

Inadequate sample size may lead to instability of estimates in both exploratory and confirmatory factor analyses. As reviewed by MacCallum *et al.* (1999; 2001), the quality of factor solutions is increased by a number of factors, including:

- A larger absolute sample size.
- A smaller number of hypothesised factors.
- High communality (>0.5) of the manifest variables; that is, a high portion of variance in that item is explained by the common factor. This is represented by the R-squared value for each item.
- Greater overdetermination of the factors; that is, the extent to which each factor is well-defined by a set of manifest variables. In general, a small number of factors defined by a large number of indicators will show greater overdetermination.

For the two-factor general specific models evaluated in this paper, communality was high for the teacher SDQ (over 0.5 for 16/20 items), but lower for the parent SDQ (over 0.5 for 9/20 items) and very low for the child SDQ (over 0.5 for 4/20 items). When communality is low, MacCallum *et al.* advise that if "there is high overdetermination of factors (e.g. six or seven indicators per factor and a rather small number of factors), one can still achieve good recovery of population factors, but larger samples are required – probably well over 100" (MacCallum, Widaman et al. 1999, p.96). The model evaluated in this paper meets the overdetermination condition, indicating that the sample sizes for Indians for parents (N=361) and teachers (N=257) are likely to be adequate. By contrast, given the much lower communality of the items on the child SDQ, the sample size of 183 Indian children is smaller than would be ideal. This may explain the greater discrepancy between the exploratory factor analysis for Indian children and the hypothesised SDQ factor structure.

Part 3: additional information on covariates

Note that full copies of the B-CAMHS survey documents are published in Meltzer *et al.* (2000) and Green *et al.* (2005).

Occupational class of household reference person

Parents were asked to state their current/most recent job and (where applicable) that of their partner. This was used generate the occupational social class of the household reference person ('head of household'). B-CAMSH99 used the Registrar General's Standard Occupational Classification (SOC) system of six social classes (I; II; III Non-manual; III Manual; IV; V) plus two additional categories of 'never worked' and 'full-time student' (OPCS 1991). B-CAMHS04 used the 39 operational categories of the newly-created National Statistics Socio-economic Classification (NS-SEC) system (Rose and Pevalin 2002). We converted these approximate SOC equivalents using the translation algorithm provided by the creators of NS-SEC (Rose, Pevalin et al. 2005, Appendix 2)

Parent's mental health

The 12-item version of the General Health Questionnaire (GHQ-12) was administered by laptop to parents (Goldberg and Williams 1998). The GHQ-12 is probably the most widely used screening instrument for common mental disorders in community settings, and has been validated both in India (Bandyopadhyay, Sinha et al. 1988; Sriram, Chandrashekar et al. 1989) and in Indian-origin groups in Britain (Jacob, Bhugra et al. 1997; Bhui, Bhugra et al. 2000).

Previous investigations have been somewhat inconsistent regarding the GHQ-12's factor structure. We therefore applied an exploratory factor analysis (for ordinal data) to the B-CAMHS data. In both Indians and Whites there were two factors with an Eigenvalue of greater than one and these were very similar between the two groups (Table 10). We used the factor structure indicated by the pooled sample as the basis for a multigroup CFA analysis, using the same methods as described in the main text. This showed adequate fit (CFI=0.983, TLI=0.987, RMSEA=0.070), indicating measurement invariance across Indians and Whites.

Table 10: GHQ factor structure indicated by exploratory factor analysis in Indians and Whites

	White (N= 13 801)		Indian (N=350)	
GHQ-12 Items	Factor 1	Factor 2	Factor 1	Factor 2
1. Able to concentrate	0.36	0.34		0.38
2. Lost much sleep		**0.77**		**0.81**
3. Playing useful part	**0.65**		**0.68**	
4. Capable of making decisions	**0.87**		**0.85**	
5. Under stress		**0.86**		**0.92**
6. Could not overcome difficulties		**0.76**		**0.80**
7. Enjoy normal activities	**0.45**	0.36	0.33	**0.52**
8. Face up to problems	**0.64**		**0.67**	
9. Feeling unhappy and depressed		**0.84**		**0.91**
10. Losing confidence		**0.76**		**0.77**
11. Think of self as worthless		**0.73**		**0.68**
12. Feeling reasonably happy	**0.50**	0.33	**0.42**	0.34

Coefficients created after geomin rotation. Coefficients of ≥0.4 shown in bold, coefficients of <0.3 not shown.

Family Functioning

The General Functioning (GF) subscale of the McMaster Family Activity Device was administered by laptop to parents. The GF scale is a 12-item measure of family functioning which generates an approximately continuous score between 1 (good family functioning) and 4 (poor family functioning) (Miller, Epstein et al. 1985).

There has been little rigorous cross-cultural evaluation of the GF scale, and we know of no relevant research in minority ethnic groups in Britain. Most previous research has focussed on investigating the factor structure of the full Family Activity Device and not just the GF scale. An exploratory principle factor analysis indicated a two-factor structure in both Indians and Whites in B-CAMHS. These seemed to be tapping into valences rather than substantive constructs, with positively worded items forming one factor and the negatively worded items the other (Table 11). In a multigroup CFA, a general-specific model of this factor structure showed evidence of measurement invariance between Indians and Whites (CFI=0.991, TLI=0.993, RMSEA=0.048).

Table 11: GF factor structure indicated by exploratory factor analysis in Indians and Whites

	White (N=13 763)		Indian (N=338)	
Items	Factor 1	Factor 2	Factor 1	Factor 2
1. Planning family activities is difficult because we misunderstand each other	**0.69**		**0.70**	
2. In times of crisis we can turn to each other for support		**0.59**		**0.46**
3. We cannot talk to each other about the sadness we feel	**0.77**		**0.76**	
4. Individuals are accepted for what they are		**0.71**		**0.48**
5. We avoid discussing our fears and concerns	**0.70**		**0.72**	
6. We can express feelings to each other		**0.67**		**0.82**
7. There is lots of bad feeling in the family	**0.67**		**0.77**	
8. We feel accepted for what we are		**0.77**		**0.71**
9. Making decisions is a problem for our family	**0.59**		**0.56**	
10. We are able to make decisions on how to solve problems		**0.57**		**0.69**
11. We don't get along well together	**0.67**		**0.43**	
12. We confide in each other		**0.62**		**0.67**

Coefficients of ≥0.4 shown in bold, coefficients of <0.3 not shown.

Physical disorders

The parent was asked to identify whether their child had any of a list of specific health complaints. We used these to create the following four binary variables:
- **Any specific neuro-developmental disorder**: epilepsy; cerebral palsy
- **Any non-specific marker of developmental immaturity or developmental disorder** ('developmental problems'): bed-wetting; speech and language problems; problems with coordination; muscle disease or weaknesses.
- **Any common physical disorder or complaint** (prevalence 2-15%): asthma; eczema; food allergy; problems with eyesight; migraine; problems with hearing; glue ear, otitis media or grommits.

- **Any rare physical disorder or complaint** (prevalence<2%): stiffness or deformity of the foot, leg, fingers, arms or back; a heart problem; kidney, urinary tract problems; obesity; a condition present since birth such as club foot or cleft palate; diabetes; any blood disorder; cancer; missing fingers, hands, arms, toes, feet or legs; cystic fibrosis; chronic fatigue syndrome; spina bifida.

Substance use

Children aged 11-16 were asked by laptop about smoking, drinking and drug use. We assumed all these behaviours were absent in children aged 5-10 years. We felt justified in this because at age 11 all these behaviours were rare to very rare, applying to just 0.09% for regular smoking, 3.5% for alcohol consumption at least twice a fortnight, and 1.7% for drug use.

Perceived emotional social support (B-CAMHS04 11-16 year olds only)

In B-CAMHS04, children were presented with seven statements about emotional social support, taken from the 1985 Health and Lifestyle Survey (HALS) of 9003 adults in Britain (Cox, Blaxter et al. 1987). Responses were: not true [coded 0]; partly true [1] or certainly true [2].

We know of no previous research applying the questions to children, and they have been relatively little evaluated even in adults. Exploratory factor analyses in B-CAMHS indicated only one factor with an Eigenvalue of >1, on which all seven items loaded strongly in Whites (loadings 0.65-0.83; Table 12). In Indians the factor loadings were somewhat lower for two items. This seemed likely simply to reflect the instability of estimates at small sample (N=69), however, as a CFA of the single factor showed evidence of measurement invariance between Indians and Whites (CFI=0.961, TLI=0.959, RMSEA=0.056). We therefore summed the responses from seven items to give a single score from 0-14.

Table 12: Exploratory factor analyses of the seven social support items in Indians and Whites

There are people I know who…	White (N= 2567)	Indian (N=69)
1. Make me feel loved	0.80	0.49
2. Make me feel happy	0.64	0.67
3. Accept me just as I am	0.74	0.68
4. Make me feel an important part of their lives	0.83	0.81
5. Give me support and encouragement	0.84	0.82
6. Would see that I am taken care of if I need to be	0.79	0.80
7. Can be relied on no matter what happens	0.78	0.49

Response options: not true [coded 0]; partly true [1]; or certainly true [2]

Part 4: full descriptive analyses of Indians and Whites

Table 13: Descriptive analysis of the child, family, school and area characteristics of the Whites and Indians in the sample, and mean parent externalising SDQ score for each level

Domain	Variable	Range/categories (N)	Descriptive statistics: percent or mean by ethnic group			Mean parent externalising score	
			White	Indian	*P* for ethnic difference	White	Indian
Ethnicity	Indian ethnicity	White (n=13868)	100.0	0.0		4.98	-
		Indian (n=361)	0.0	100.0		-	3.90
A priori confounders	Child's sex	Male (7056 White, 189 Indian)	50.8	52.5	0.54 (x)	5.66	4.25
		Female (6984 White, 172 Indian)	49.2	47.6		4.27	3.51
	Child's age	Range 5-16 years	m=10.2	m=10.3	0.29 (z)		
		5-6 (2402 White, 55 Indian)	17.3	15.2	0.69 (x)	5.47	4.67
		7-8 (2476 White, 57 Indian)	17.8	16.3		5.26	4.00
		9-10 (2562 White, 71 Indian)	18.2	19.3		5.03	4.13
		11-12 (2465 White, 75 Indian)	17.7	20.4		4.78	3.85
		13-14 (2325 White, 59 Indian)	17.2	16.7		4.74	3.64
		15-16 (1638 White, 44 Indian)	11.9	12.2		4.43	2.87
	Survey year	1999 (7872 White, 194 Indian)	58.0	54.5	0.50 (x)	5.1	4.4
		2004 (5996 White, 167 Indian)	42.0	45.5		4.8	3.3
Area	Geographical region	South East (2409 White, 26 Indian)	17.4	7.0	<0.001 (x)	4.86	3.67
		London (1104 White, 109 Indian)	8.9	33.0		4.84	3.61
		South West (1643 White, 5 Indian)	11.6	1.3		4.85	[3.92]
		Eastern (1611 White, 14 Indian)	11.6	3.8		4.77	2.37
		East Midlands (1217 White, 72 Indian)	8.5	18.6		4.99	4.56
		West Midlands (1458 White, 61 Indian)	10.5	16.3		5.17	4.17
		North East (788 White, 3 Indian)	5.9	0.9		5.31	[3.98]
		North West & Merseyside (2155 White, 58 Indian)	15.5	16.1		5.10	4.20
		Yorkshire & Humberside (1483 White, 13 Indian)	10.7	3.6		5.08	2.62
	Metropolitan region	Non-Metropolitan (7820 White, 117 Indian)	55.6	30.7	<0.001 (x)	4.94	4.28
		Metropolitan (6048 White, 244 Indian)	44.4	69.3		5.02	3.73
	Area deprivation	Range 0.59 – 82.3 points	m=21.0	m=26.9	<0.001 (y)		
		0-10 (3901 White, 56 Indian)	28.1	15.5	<0.001 (x)	4.25	3.77
		10-20 (4407 White, 90 Indian)	31.7	25.4		4.62	3.61
		20-30 (2310 White, 68 Indian)	16.7	18.9		5.30	3.82
		30-40 (1379 White, 72 Indian)	10.0	19.9		5.87	4.02
		40-50 (820 White, 38 Indian)	6.0	10.6		6.23	5.06
		50-60 (665 White, 23 Indian)	4.8	6.2		6.40	3.61
		60-70 (287 White, 12 Indian)	2.1	3.3		6.25	3.49
		70+ points (92 White, 1Indian)	0.7	0.3		6.05	[5.00]
School	Ford score	Range 0-17 points	m=4.98	m=5.32	0.17 (y)		
		0-2 (2931 White, 69 Indian)	23.3	23.0	0.08 (x)	4.01	3.66
		3-5 (4606 White, 85 Indian)	36.8	27.9		4.73	3.76
		6-8 (3293 White, 103 Indian)	26.5	33.9		5.30	4.43
		9-11 (1326 White, 36 Indian)	10.7	12.1		6.16	3.64
		12-14 (294 White, 9 Indian)	2.4	2.9		6.42	[3.98]
		15-17 (51 White, 1 Indian)	0.4	0.4		6.95	[3.00]
Family SEP	Parent's highest	No qualifications (2717 White, 102 Indian)	19.8	28.3	<0.001 (x)	6.30	4.27

Domain	Variable	Range/categories (N)	Descriptive statistics: percent or mean by ethnic group			Mean parent externalising score	
			White	Indian	*P* for ethnic difference	White	Indian
	educational qualification	Poor GCSEs (2063 White, 64 Indian)	14.9	17.7		5.62	4.02
		Good GCSEs (4337 White, 68 Indian)	31.3	18.9		4.86	4.08
		A-level (1487 White, 24 Indian)	10.7	6.8		4.45	3.90
		Diploma (1496 White, 35 Indian)	10.8	9.7		4.15	3.86
		Degree (1715 White, 65 Indian)	12.5	18.6		3.49	3.06
	Weekly household income	£0-99 (506 White, 9 Indian)	3.9	2.9	<0.001 (x)	6.23	[3.97]
		£100-199 (1905 White, 34 Indian)	14.6	10.8		6.30	5.19
		£200-299 (1727 White, 77 Indian)	13.1	24.7		5.81	3.71
		£300-399 (1578 White, 44 Indian)	12.0	13.9		5.31	4.78
		£400-499 (1464 White, 32 Indian)	11.1	10.6		4.96	4.60
		£500-599 (1319 White, 23 Indian)	10.1	7.4		4.49	3.68
		£600-769 (1802 White, 23 Indian)	13.7	7.6		4.22	3.51
		£770 and over (2806 White, 67 Indian)	21.5	22.3		3.80	3.64
	Housing tenure	Owner occupied (9854 White, 320 Indian)	71.0	88.7	<0.001 (x)	4.40	3.84
		Social sector rented (3109 White, 27 Indian)	22.5	7.7		6.64	4.37
		Privately rented (901 White, 13 Indian)	6.5	3.6		5.60	4.21
	Occupational social class	I (747 White, 31 Indian)	5.6	9.4	0.03 (x)	3.77	3.91
		II (4125 White, 102 Indian)	30.6	30.3		4.19	3.78
		III Non-manual (2743 White, 55 Indian)	19.9	15.7		4.96	3.62
		III Manual (2435 White, 61 Indian)	18.1	17.9		5.21	4.33
		IV (2530 White, 79 Indian)	18.5	22.9		5.71	4.00
		V (680 White, 10 Indian)	5.0	3.0		6.22	4.94
		Never worked (189 White, 3 Indian)	1.4	0.9		7.16	[6.19]
		Full-time student (125 White, 0 Indian)	0.9	0.0		5.55	[empty cell]
	Mother's economic activity [nested]	Full-time employed (3255 White, 117 Indian)	24.2	33.3	<0.001 (x)	4.63	3.56
		Part-time employed (6204 White, 101 Indian)	46.0	28.3		4.58	4.15
		Home and family (3134 White, 112 Indian)	23.4	31.2		5.85	4.27
		Unemployed (352 White, 7 Indian)	2.7	2.0		5.68	[2.75]
		Other (503 White, 18 Indian)	3.8	5.1		5.75	2.99
	Father's economic activity [nested]	Full-time employed (9511 White, 266 Indian)	87.3	79.6	0.003 (x)	4.54	3.91
		Part-time employed (353 White, 21 Indian)	3.2	6.2		4.92	4.18
		Home and family (213 White, 9 Indian)	1.9	2.7		6.06	[3.28]
		Unemployed (315 White, 15 Indian)	2.9	4.7		6.59	5.31
		Other (509 White, 24 Indian)	4.7	6.9		5.73	2.54
Family composition	Family type	Two-parent family (9052 White, 332 Indian)	65.4	92.2	<0.001 (x)	4.45	3.84
		Step family (1689 White, 4 Indian)	12.1	1.1		6.05	[3.86]
		Lone parent family (3104 White, 25 Indian)	22.4	6.7		5.93	4.70
	Marital status [nested]	Married (9446 White, 334 Indian)	88.0	99.5	<0.001 (x)	4.55	3.84
		Cohabiting (1295 White, 2 Indian)	12.0	0.5		5.85	[5.04]

Domain	Variable	Range/categories (N)	Descriptive statistics: percent or mean by ethnic group			Mean parent externalising score	
			White	Indian	*P* for ethnic difference	White	Indian
	Three generation household	No grandparent in household (13608 White, 309 Indian)	98.1	85.5	<0.001 (x)	4.97	3.82
		Grandparent in household (260 White, 52 Indian)	1.9	14.5		5.41	4.36
	Number of co-resident siblings	0 (2652 White, 51 Indian)	19.3	14.3	0.08 (x)	4.78	2.93
		1 (6541 White, 166 Indian)	47.1	46.4		4.82	3.98
		2 (3261 White, 95 Indian)	23.5	25.8		5.01	4.19
		3 (1035 White, 34 Indian)	7.4	9.4		5.93	4.30
		4 or more (379 White, 15 Indian)	2.7	4.1		6.32	3.61
	Mother's age at child's birth	Range '17 or less' to '40 or more'	m=27.9	m=27.8	0.41 (y)		
		≤19 (712 White, 13 Indian)	5.3	3.5	0.29 (x)	6.49	4.04
		20-24 (2902 White, 85 Indian)	21.7	23.7		5.87	3.93
		25-29 (4622 White, 137 Indian)	34.5	38.5		4.81	4.16
		30-34 (3561 White, 85 Indian)	26.6	24.0		4.44	3.52
		35-39 (1349 White, 33 Indian)	10.1	9.2		4.07	3.46
		40 or more (238 White, 4 Indian)	1.8	1.1		4.41	[4.48]
Family stress	**Parent mental health**	Range 0-12 points	m=1.71	m=1.75	0.52 (z)		
		0-1 (9338 White, 238 Indian)	67.6	68.0	0.55 (x)	4.53	3.78
		2-3 (1976 White, 43 Indian)	14.3	12.3		5.50	4.10
		4-5 (989 White, 26 Indian)	7.2	7.3		5.66	3.31
		6-7 (642 White, 22 Indian)	4.7	6.3		6.26	4.56
		8-9 (439 White, 8 Indian)	3.2	2.5		6.43	[4.29]
		10-12 (417 White, 13 Indian)	3.0	3.7		6.91	4.83
	Family functioning	Range 1-3.75 points	m=1.69	m=1.80	<0.001 (z)		
		1.0-1.49 (4206 White, 75 Indian)	30.5	22.2	<0.001 (x)	3.93	3.08
		1.5-1.99 (5835 White, 130 Indian)	42.5	38.1		4.88	3.84
		2.0-2.49 (3274 White, 119 Indian)	23.8	35.5		5.95	4.47
		2.5-2.99 (388 White, 14 Indian)	2.8	4.2		8.33	4.70
		3.0-4.0 (60 White, 0 Indian)	0.4	0.0		8.68	[empty cell]
	Parental separation	No (9470 White, 328 Indian)	68.5	91.6	<0.001 (x)	4.51	3.87
		Yes (4369 White, 31 Indian)	31.5	8.4		5.98	4.14
	Family financial crisis	No (11753 White, 319 Indian)	84.9	89.4	0.02 (x)	4.89	3.87
		Yes (2080 White, 39 Indian)	15.1	10.6		5.44	4.12
	Family police contact	No (12981 White, 346 Indian)	93.8	96.9	0.02 (x)	4.85	3.92
		Yes (855 White, 11 Indian)	6.2	3.1		6.72	3.29
	Death of parent or sibling	No (13366 White, 351 Indian)	96.6	97.7	0.27 (x)	4.94	3.89
		Yes (473 White, 8 Indian)	3.4	2.3		5.69	[4.08]
Child	**Neuro-developmental disorder**	No (13 741 White, 360 Indian)	99.1	99.7	0.26 (x)	8.03	[6.00]
		Yes (125 White, 1 Indian)	0.9	0.3		4.70	3.83
	Developmental problems	No (12,523 White, 344 Indian)	90.3	95.3	0.001 (x)	7.59	5.27
		Yes (1344 White, 17 Indian)	9.7	4.7		4.66	3.61
	Common physical disorder	No (8377 White, 239 Indian)	60.4	66.4	0.03 (x)	5.46	4.47
		Yes (5490 White, 122 Indian)	39.6	33.6		4.91	3.88
	Rare	No (12 978 White, 349 Indian)	93.6	96.7	0.03 (x)	5.97	4.57

| Domain	Variable	Range/categories (N)	Descriptive statistics: percent or mean by ethnic group			Mean parent externalising score	
			White	Indian	*P* for ethnic difference	White	Indian
	physical disorder	Yes (890 White, 12 Indian)	6.4	3.3		4.82	3.90
	Serious illness leading to hospitalisation	No (11386 White, 319 Indian)	82.2	88.7	0.002 (x)	5.66	3.81
		Yes (2452 White, 40 Indian)	17.8	11.3		4.92	3.87
	Death of friend	No (12997 White, 349 Indian)	93.9	97.2	0.01 (x)	5.76	4.66
		Yes (840 White, 10 Indian)	6.1	2.8		4.86	3.95
	Regular smoker	No (12 7999 White, 334 Indian)	97.2	98.9	0.11 (x)	7.51	[5.75]
		Yes (363 White, 4 Indian)	2.7	1.2		4.93	3.94
	Alcohol consumption	Less than once a fortnight (12 126 White, 333 Indian)	92.1	98.5	<0.001 (x)	4.87	[4.80]
		Once a fortnight to once a week (803 White, 4 Indian)	6.2	1.2		5.42	[8.00]
		Twice a week or more (229 White, 1 Indian)	1.8	0.4		4.89	3.93
	Ever used drugs	No (12 646 White, 329 Indian)	96.1	97.2	0.34 (x)	6.08	[5.38]
		Yes (509 White, 9 Indian)	3.4	2.8			
	Teacher-reported academic difficulties	Range 0-9 points	m=3.03	m=2.71	0.05 (z)		
		0-1 (3352 White, 91 Indian)	31.9	37.1	0.28 (x)	7.96	[4.88]
		2-3 (3689 White, 85 Indian)	34.9	33.4		7.15	4.43
		4-5 (1461 White, 36 Indian)	13.8	14.5		5.85	4.52
		6-7 (1361 White, 26 Indian)	12.9	10.0		4.49	3.38
		8-9 (694 White, 13 Indian)	6.6	5.0		4.95	3.89
	Learning difficulty	No (12 680 White, 351 Indian)	91.4	97.1	<0.001 (x)	8.03	[6.00]
		Yes (5490 White, 10 Indian)	8.6	2.9		4.70	3.83
	Dyslexia	No (13 378 White, 359 Indian)	96.4	99.5	<0.001 (x)	7.59	5.27
		Yes (489 White, 2 Indian)	3.6	0.5		4.66	3.61
Child, 1999 only	Formal reading assessment	Range -3.1 s.d. to +2.7 s.d. from average	m=0.00	m=0.13	0.24 (y)		
		>2 s.d. below average (180 White, 1 Indian)	2.6	0.5	0.42 (x)	8.75	[7.00]
		1-2 s.d. below average (1005 White, 16 Indian)	14.2	9.6		7.06	6.08
		0-1 s.d. below average (2221 White, 59 Indian)	31.4	35.5		5.63	4.38
		0-1 s.d. above average (2434 White, 59 Indian)	34.5	34.8		4.35	4.26
		1-2 s.d. above average (1104 White, 30 Indian)	15.7	17.8		3.44	3.61
		>2 s.d. above average (123 White, 3 Indian)	1.7	1.8		3.30	[3.94]
	Formal spelling assessment	Range -3.5 s.d. to +3.1 s.d. from average	m=0.00	m=0.32	0.001 (y)		
		>2 s.d. below average (185 White, 4 Indian)	2.7	2.3	0.02 (x)	8.67	[5.50]
		1-2 s.d. below average (995 White, 10 Indian)	14.2	6.1		7.11	7.56

Domain	Variable	Range/categories (N)	Descriptive statistics: percent or mean by ethnic group			Mean parent externalising score	
			White	Indian	*P* for ethnic difference	White	Indian
		0-1 s.d. below average (2160 White, 41 Indian)	30.9	24.4		5.63	4.71
		0-1 s.d. above average (2568 White, 74 Indian)	36.8	44.1		4.32	4.10
		1-2 s.d. above average (944 White, 33 Indian)	13.5	19.6		3.39	3.45
		>2 s.d. above average (129 White, 6 Indian)	1.9	3.5		2.64	[4.15]
	Reward: praise	Never (23 White, 1 Indian)	0.3	0.6	<0.001 (x)	7.26	[5.00]
		Seldom (60 White, 3 Indian)	0.8	1.4		6.87	[6.65]
		Sometimes (1211 White, 69 Indian)	15.5	35.8		6.02	5.45
		Frequently (6573 White, 119 Indian)	83.4	62.2		4.91	3.67
	Punish: non-physical	Never (195 White, 11 Indian)	2.5	5.8	<0.001 (x)	2.81	1.53
		Seldom (1119 White, 16 Indian)	14.3	8.2		3.33	3.69
		Sometimes (3932 White, 123 Indian)	49.9	63.3		4.61	4.58
		Frequently (2622 White, 44 Indian)	33.3	22.7		6.80	4.78
	Punish: smacking	Never (4304 White, 119 Indian)	55.0	61.6	0.001 (x)	4.42	3.98
		Seldom (2839 White, 46 Indian)	35.8	23.6		5.65	4.39
		Sometimes (690 White, 26 Indian)	8.7	13.3		6.97	6.15
		Frequently (36 White, 3 Indian)	0.5	1.5		10.57	[4.63]
	Punish: ever hit or shake	Never (7669 White, 179 Indian)	97.5	92.1	<0.001 (x)	5.05	4.25
		Ever (199 White, 15 Indian)	2.6	7.9		7.39	5.83
Child, 2004 only, 11 to 16 year olds only only]	Social support score	Range 0 to 14 points	m=12.6	m=12.5	0.32 (z)		
		0-7 (68 White, 0 Indian)	2.7	0.0	0.45 (x)	6.30	[empty cell]
		8-9 (115 White, 3 Indian)	4.5	4.4		5.96	[6.36]
		10-11 (255 White, 10 Indian)	10.0	14.0		5.94	3.80
		12-13 (689 White, 22 Indian)	27.2	32.9		4.69	4.23
		14 (1398 White, 32 Indian)	55.6	48.7		3.43	2.29
	No. close relatives in the home	None (71 White, 2 Indian)	2.8	2.7	0.77 (x)	6.36	[3.00]
		One (422 White, 9 Indian)	16.6	13.3		5.27	[3.90]
		Two or more (2037 White, 56 Indian)	80.7	84.0		3.94	3.24
	No. close relatives outside home	None (296 White, 14 Indian)	11.6	19.5	0.09 (x)	4.35	2.94
		One (434 White, 8 Indian)	17.1	10.9		4.97	[2.14]
		Two or more (1801 White, 46 Indian)	71.3	69.6		4.03	3.65
	How often child helps relatives	Every day (378 White, 20 Indian)	14.8	28.0	0.06 (x)	4.30	2.89
		Once a week (1408 White, 30 Indian)	55.7	45.9		4.08	3.95
		Once a month (428 White, 12 Indian)	17.1	18.3		4.21	2.70
		Less than once a month (137 White, 4 Indian)	5.5	6.1		4.40	[4.21]
		Never (172 White, 1 Indian)	6.9	1.6		5.13	[0.00]

s.d. = standard deviation. Nested analyses: Mother's economic activity was only collected in households in which the mother (or mother substitute) was present; father's economic activity where the father was present; and parent marital status in families where both were present. (x)=p-value from chi-squared test for association; (y) p-value calculated using a T-test (normally distributed continuous variables); (z) p-value calculated using a Wilcoxon non-parametric test (non-normal continuous variables). When presenting parent externalising scores, brackets are used to indicate means based on fewer than 10 children.

## Interrelation between measures of family SEP and area deprivation for Indians and Whites

As shown in Table 13, Indians were systematically disadvantaged for area deprivation, advantaged in housing tenure, concentrated at the extremes of the distribution for parent education, and not much different for occupational social class and income. Further analyses revealed that household income, parent education and social class showed a very similar relationship to each other in Indians and Whites (Figure 5). By contrast, area deprivation scores were systematically higher in Indians than Whites after stratifying by family SEP, but the gradient (i.e. the degree of social differentiation *within* ethnic group) was similar (Figure 6). Home-ownership showed a different pattern again: the proportion of Indian and White home-owners was very similar in the most advantaged groups, but whereas in Whites there was a steep gradient with SEP and area deprivation,[*] this was not observed in Indians (Figure 7)

Figure 5: Mean weekly household income by parent's education and occupational social class
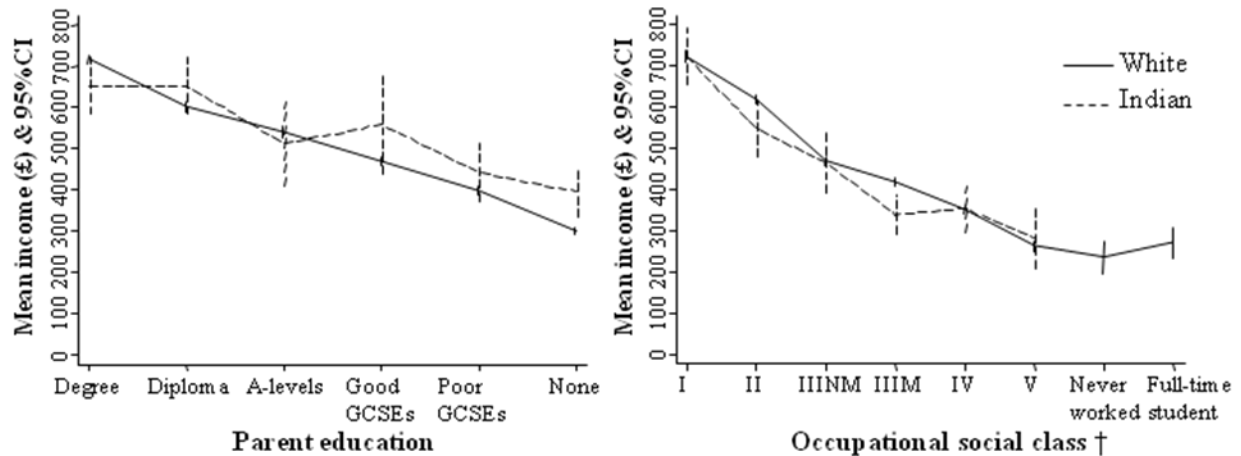
Figure 6: Mean area deprivation by parent's education and occupational social class

(Note: results were similar for household income)

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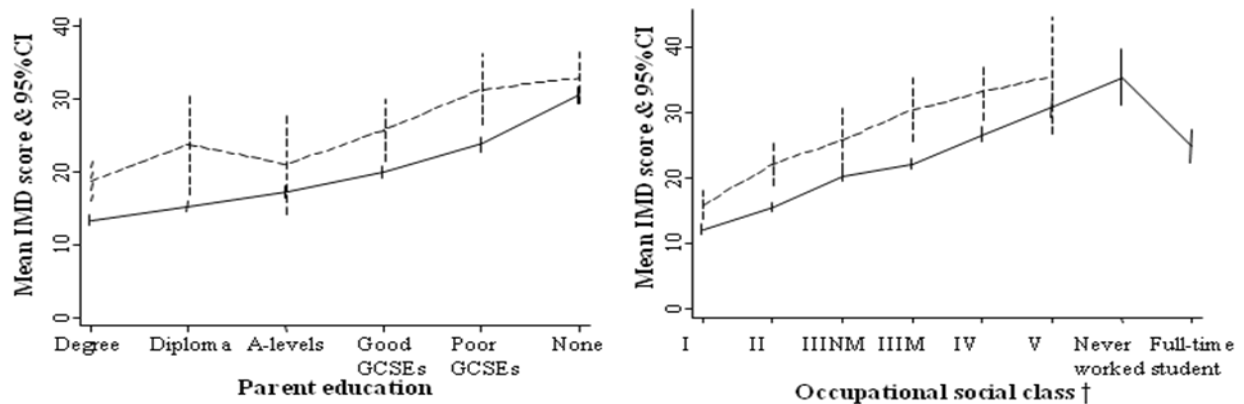
[*] Note that 'difficulty of access to owner-occupation' (the modelled proportion of households unable in 2002 to afford to enter owner-occupation) forms part of the IMD. It is only one of 37 such indicators, however, and the circularity in comparing home-ownership with area deprivation is therefore low.

Figure 7: Proportion of home-owners by parent's education and area deprivation

(Note: results were similar for household income and occupational social class)
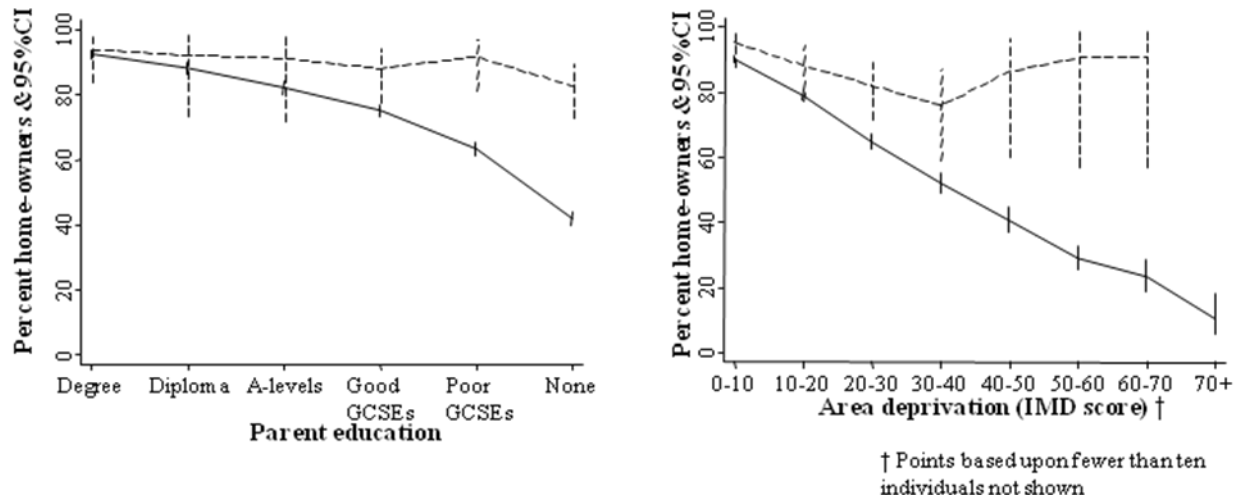
Social differential of two-parent families for Indians and Whites

Two-parent families were substantially more common in Indians than Whites (92.2% vs. 65.4% in Whites). They were also less socially differentiated, as illustrated in Figure 8.

Figure 8: Prevalence of two-parent families in Indians and Whites, by parent education and area deprivation
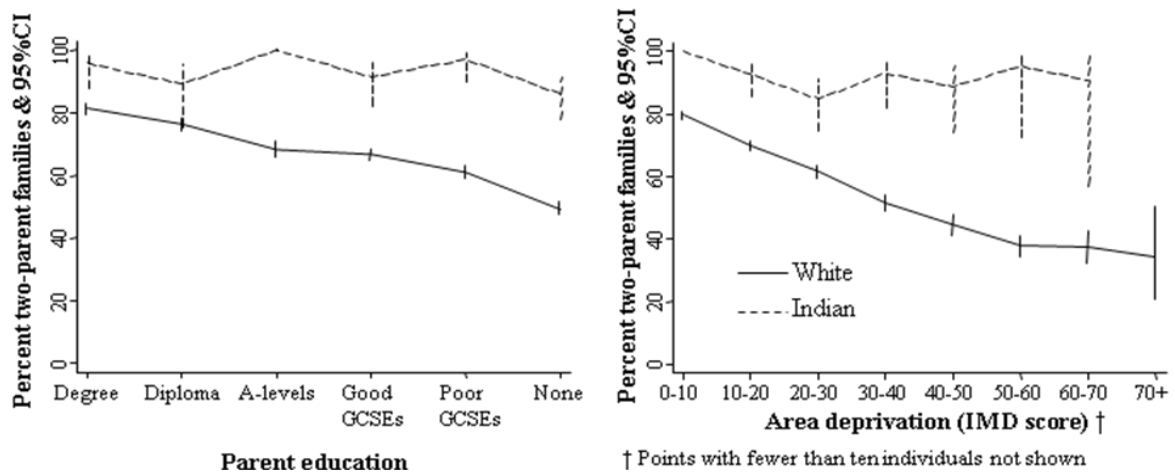
Comparison between the family functioning score and parent mental health for Indians and Whites

As presented above in Part 1 of the supplementary material, the 'General Functioning' (GF) family functioning scale of the McMaster Family Activity Device had the same factor structure in Indians and Whites. Because the worse parent-reported family functioning in Indian families was unexpected, we investigated further its relationship with parent mental health, the other continuous measure of family stress. As expected these two variables were positively associated in both ethnic groups. Moreover, the strength of the correlation was very similar in the two ethnic groups (Pearson's coefficient 0.25 in Indians and 0.26 in Whites), and the mean GHQ score of Indian and White parents was similar after stratifying by family functioning (Figure 9). This provides some evidence that the GF scale provides a measure of family functioning which is comparable between Indians and Whites.

Figure 9: Mean parent GHQ score in Indians and Whites, stratified by family functioning
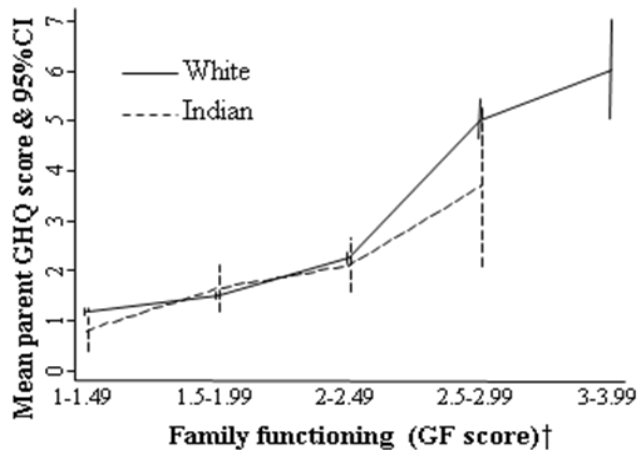
† Points with fewer than ten individuals not shown

Part 5: full details on models explaining the Indian advantage

Table 14: Effect of adjusting for each child, family, school and area characteristics upon the parent and teacher externalising score

	Variable	Parent externalising score			Teacher externalising score		
		Unadjusted regression coefficient†	Adjusted regression coefficient	Change	Unadjusted regression coefficient†	Adjusted regression coefficient	Change
A priori confounders	Child's sex [a]	1.06	1.08	+0.02	1.01	1.05	+0.04
	Child's age [b]	1.09	1.08	-0.01	1.05	1.05	0.00
	Survey year [a]	1.09	1.08	-0.01	1.05	1.05	0.00
Area	Geographical region [a]	1.08	1.08	0.00	1.05	1.03	-0.02
	Metropolitan region [a]	1.08	1.09	+0.01	1.05	1.09	+0.04
	Area deprivation [c]	1.08	1.38	+0.30	1.05	1.30	+0.25
School	Ford score [b]	1.08	1.15	+0.07	1.05	1.10	+0.05
Family SEP	Parent's highest educational qualification [a]	1.08	1.17	+0.09	1.05	1.10	+0.05
	Weekly household income [a]	1.08	1.17	+0.09	1.05	1.15	+0.10
	Housing tenure [a]	1.08	0.73	-0.35	1.05	0.72	-0.33
	Occupational social class [a]	1.08	1.01	-0.07	1.05	0.96	-0.09
	Mother's economic activity [nested] [a]	1.08	1.20	+0.12	1.03	1.16	+0.13
	Father's economic activity [nested] [a]	0.87	0.95	+0.08	0.81	0.93	+0.12
ALL LEVEL 1 VARIABLES		1.08	0.99	-0.09	1.05	0.93	-0.12
Family composition	Family type [a]	1.08	0.65	-0.43	1.05	0.63	-0.42
	Marital status [nested] [a]	0.87	0.72	-0.15	0.79	0.65	-0.14
	Three generation household [a]	1.08	1.13	+0.05	1.05	1.14	+0.09
	No. co-resident siblings [a]	1.08	1.12	+0.04	1.05	1.09	+0.04
	Mother's age at child's birth [c]	1.08	1.08	0.00	1.05	1.04	-0.01
Family stress	Parent mental health [d]	1.08	1.09	+0.01	1.05	1.07	+0.02
	Family functioning [b]	1.08	1.34	+0.26	1.05	1.19	+0.14
	Parental separation [a]	1.08	0.72	-0.36	1.05	0.70	-0.35
	Family financial crisis [a]	1.08	1.05	-0.03	1.05	1.03	-0.02
	Family police contact [a]	1.08	1.02	-0.06	1.05	1.00	-0.05
	Death of parent or sibling [a]	1.08	1.07	-0.01	1.05	1.04	-0.01
ALL LEVEL 2 VARIABLES		1.08	1.08	0.00	1.05	0.91	-0.14
Child	Neuro-developmental disorder [a]	1.08	1.06	-0.02	1.05	1.04	-0.01
	Developmental problems [a]	1.08	0.95	-0.13	1.05	0.98	-0.07
	Common physical disorder [a]	1.08	1.03	-0.05	1.05	1.03	-0.02
	Rare physical disorder [a]	1.08	1.04	-0.04	1.05	1.04	-0.01

	Variable	Parent externalising score			Teacher externalising score		
		Unadjusted regression coefficient†	Adjusted regression coefficient	Change	Unadjusted regression coefficient†	Adjusted regression coefficient	Change
	Serious illness leading to hospitalisation [a]	1.08	1.03	-0.05	1.05	1.02	-0.03
	Death of friend [a]	1.08	1.04	-0.04	1.05	1.03	-0.02
	Regular smoker [a]	1.08	1.00	-0.08	1.05	0.96	-0.09
	Alcohol consumption [a]	1.08	1.03	-0.05	1.05	0.99	-0.06
	Ever used drugs [a]	1.08	1.05	-0.03	1.05	1.00	-0.05
	Learning difficulty [a]	1.08	0.84	-0.24	1.05	0.86	-0.19
	Dyslexia [a]	1.08	1.01	-0.07	1.05	1.01	-0.04
	Teacher-reported academic difficulties [b]	1.08	0.89	-0.19	1.05	0.78	-0.27
ALL LEVEL 3 VARIABLES FROM BOTH DATASETS		1.08	0.64	-0.44	1.05	0.66	-0.39
Child, 1999 only	Formal test: reading [c]	0.80	0.65	-0.15	1.07	0.90	-0.17
	Formal test: spelling [c]	0.80	0.41	-0.39	1.07	0.68	-0.39
	Reward: praise [a]	0.80	1.06	+0.26	1.07	1.16	+0.09
	Punish: non-physical [a]	0.80	0.59	-0.21	1.07	1.03	-0.04
	Punish: smacking [a]	0.80	0.84	+0.04	1.07	1.07	0.00
	Punish: ever hit or shake [a]	0.80	0.92	+0.12	1.07	1.13	+0.06
Child, 2004 only, age 11 to 16	Social support score [c]	1.42	1.42	0.00	1.03	1.09	+0.06
	No. close relatives in the home [a]	1.42	1.41	-0.01	1.03	0.99	-0.04
	No. close relatives outside the home [a]	1.42	1.46	+0.04	1.03	1.04	+0.01
	How often child helps relatives [a]	1.42	1.43	+0.01	1.03	1.02	-0.01

Nested analyses: Mother's economic activity was only collected in households in which the mother (or mother substitute) was present; father's economic activity where the father was present; and marital status in families where both were present. For these variables and for the variables collected only in one of the two B-CAMHS surveys, we restrict both the unadjusted and the adjusted to the relevant subpopulation of children.

a]=variable entered as categorical; [b] variable entered as a linear term; [c] variable entered as a linear plus quadratic term; [d] variable entered as a linear, quadratic plus cubic term, according to how they were modelled when calculating the univariable association between that variable and child mental health.

All models adjust for child's sex, age and survey year.

Table 15: Ethnic differences in mean externalising SDQ scores and odds ratio for disorder in the full population

	Adjusted for:	Regression coefficient from linear regression			Odds ratio from logistic regression
		Parent SDQ (13 868 White, 361 Indian)	Teacher SDQ (10 775 White, 257 Indian)	Child SDQ (5737 White, 154 Indian)	DAWBA (13 868 White, 361 Indian)
Externalising problems	Sex, age and survey year	1.08 (0.73, 1.43)***	1.05 (0.67, 1.43)***	1.24 (0.70, 1.77)***	3.98 (1.59, 9.97)**
	Plus academic abilities	0.80 (0.46, 1.15)***	0.78 (0.43, 1.12)***	1.15 (0.63, 1.68)***	3.34 (1.30, 8.63)*
	Plus family type and parental divorce	0.51 (0.17, 0.84)**	0.52 (0.18, 0.87)**	0.94 (0.43, 1.45)**	2.46 (0.95, 6.39)
	Plus area, school and family SEP	0.60 (0.25, 0.94)**	0.58 (0.21, 0.95)**	0.89 (0.36, 1.42)***	2.60 (0.99, 6.84)
	Plus other family composition and stress	0.69 (0.34, 1.04)***	0.66 (0.28, 1.04)**	0.99 (0.49, 1.49)***	2.80 (1.06, 7.37)*
	Plus other child variables	0.55 (0.19, 0.91)**	0.57 (0.19, 0.95)**	0.82 (0.34, 1.31)**	2.58 (0.96, 6.90)
	Plus; family functioning	0.71 (0.35, 1.08)***	0.62 (0.24, 1.00)**	0.92 (0.44, 1.39)***	2.69 (1.01, 7.15)*
Internalising problems	Sex, age and survey year	-0.21 (-0.67, 0.25)	0.30 (-0.20, 0.80)	0.15 (-0.33, 0.62)	1.86 (0.89, 3.89)
	Plus academic difficulties and learning difficulties	-0.42 (-0.85, 0.02)	0.11 (-0.36, 0.58)	0.06 (-0.39, 0.52)	1.64 (0.79, 3.43)
	Plus family type and parental divorce	-0.59 (-1.03, -0.15)**	0.00 (-0.47, 0.47)	-0.06 (-0.51, 0.39)	1.33 (0.63, 2.79)
	Plus area, school and family SEP	-0.50 (-0.94, -0.05)*	0.11 (-0.37, 0.59)	-0.05 (-0.51, 0.41)	1.39 (0.66, 2.92)
	Plus other family composition and stress	-0.41 (-0.85, 0.03)	0.15 (-0.32, 0.62)	0.04 (-0.41, 0.48)	1.57 (0.75, 3.28)
	Plus other child variables	-0.52 (-0.96, -0.08)*	0.10 (-0.37, 0.58)	-0.03 (-0.46, 0.41)	1.31 (0.65, 2.64)
	Plus; family functioning	-0.43 (-0.87, 0.01)	0.12 (-0.36, 0.59)	-0.01 (-0.44, 0.42)	1.33 (0.66, 2.66)

*p<0.05, **p<0.01, ***p<0.001. Table presents regression coefficients for White (vs. Indian) ethnicity from linear regression for the SDQ outcomes and logistic regression for DAWBA diagnosis.

Part 6: full information on tests for interactions

Socio-economic disadvantage: univariable analyses

All measures of socio-economic disadvantage showed evidence of an interaction with Indian ethnicity such that the deprivation gradient of externalising problems was less marked in Indians than in Whites (Table 16, Figure 10). Moreover, not only was the gradient flatter (in some cases almost flat) in Indians, but the absolute values at the most advantaged end were almost the same. In other words, there was little or no Indian mental health advantage among the most socio-economically advantaged families – instead the advantage was largely confined to less privileged groups.

That *all* SEP/area deprivation indicators showed this pattern is very important. If the interaction were seen on just one or two indicators then this might imply that it resulted from the different pattern of inter-relationship between the SEP indicators in Indians and Whites. For example, home ownership is less socially differentiated in Indians than in Whites (Figure 5) and it would therefore be unsurprising if housing tenure were less strongly associated with mental health in Indians. In fact, however, the interaction is also seen for parent education, income and social class which show similar degrees of social differentiation in Indians and Whites. This consistency across all indicators therefore implies that the observed SEP interactions cannot readily be explained as an artefact, and is more likely to reflect a genuine flattening of the socio-economic gradient in Indians.

Table 16: Univariable p-values for interactions between ethnicity and socio-economic disadvantage

P-value for interaction between ethnicity and:	Parents externalising scores	Teachers externalising scores
Area deprivation	0.03	0.008
Parent's education	<0.001 [0.006 if categorical]	0.02 [0.06 if categorical]
Household income	<0.001 [0.002 if categorical]	0.06 [0.02 if categorical]
Housing tenure	0.02	<0.001
Social class	0.01	0.49

Area deprivation, parent education and household income were entered as linear terms, housing tenure and social class categorical. All models were linear regression models with interaction terms between ethnicity and each covariate in question, adjusting for age, gender and survey year.

Figure 10: Parent and teacher externalising scores for Indians and Whites for selected measures of socio-economic disadvantage

Parent SDQ

Teacher SDQ

Tenure

Social class
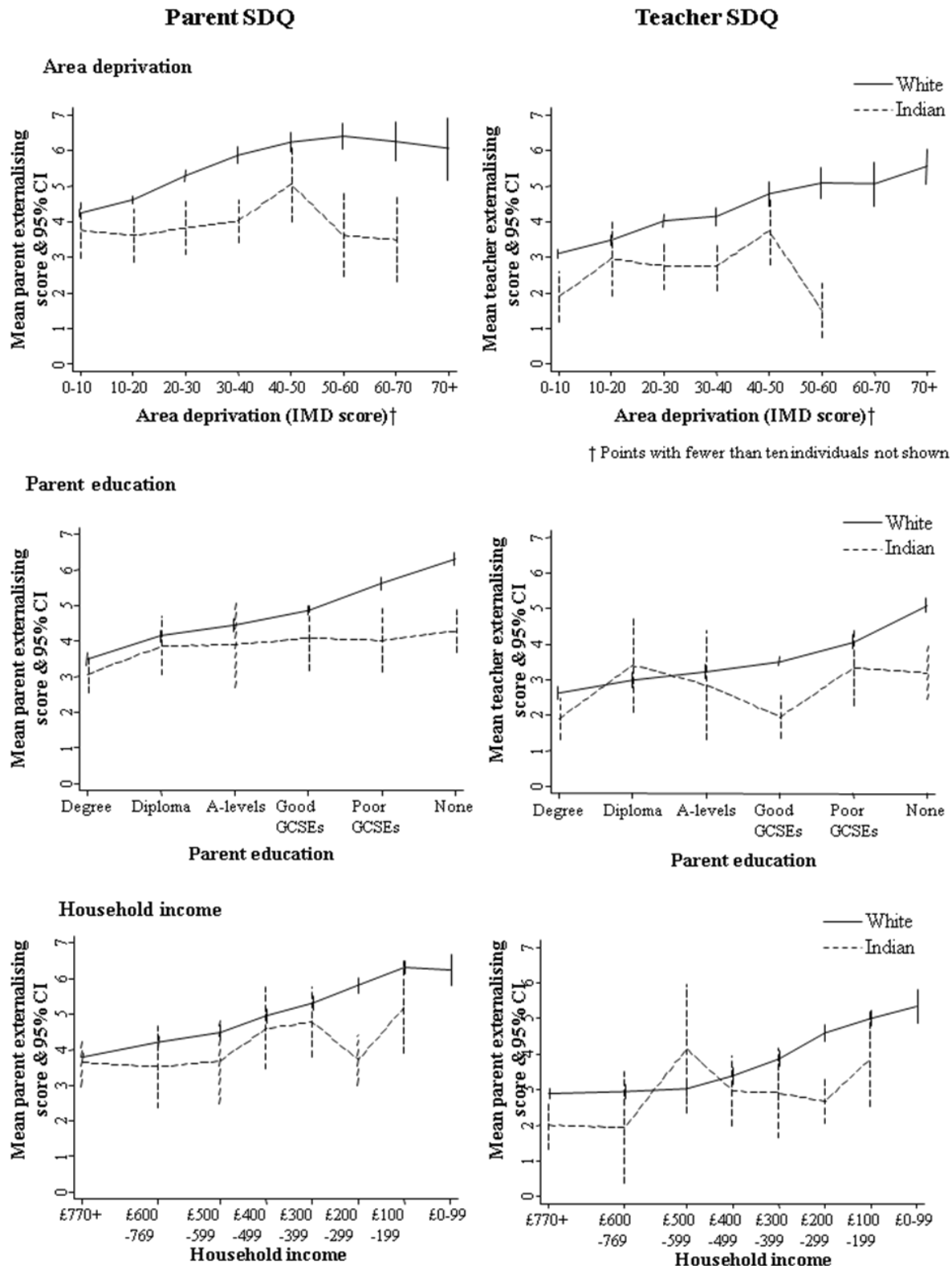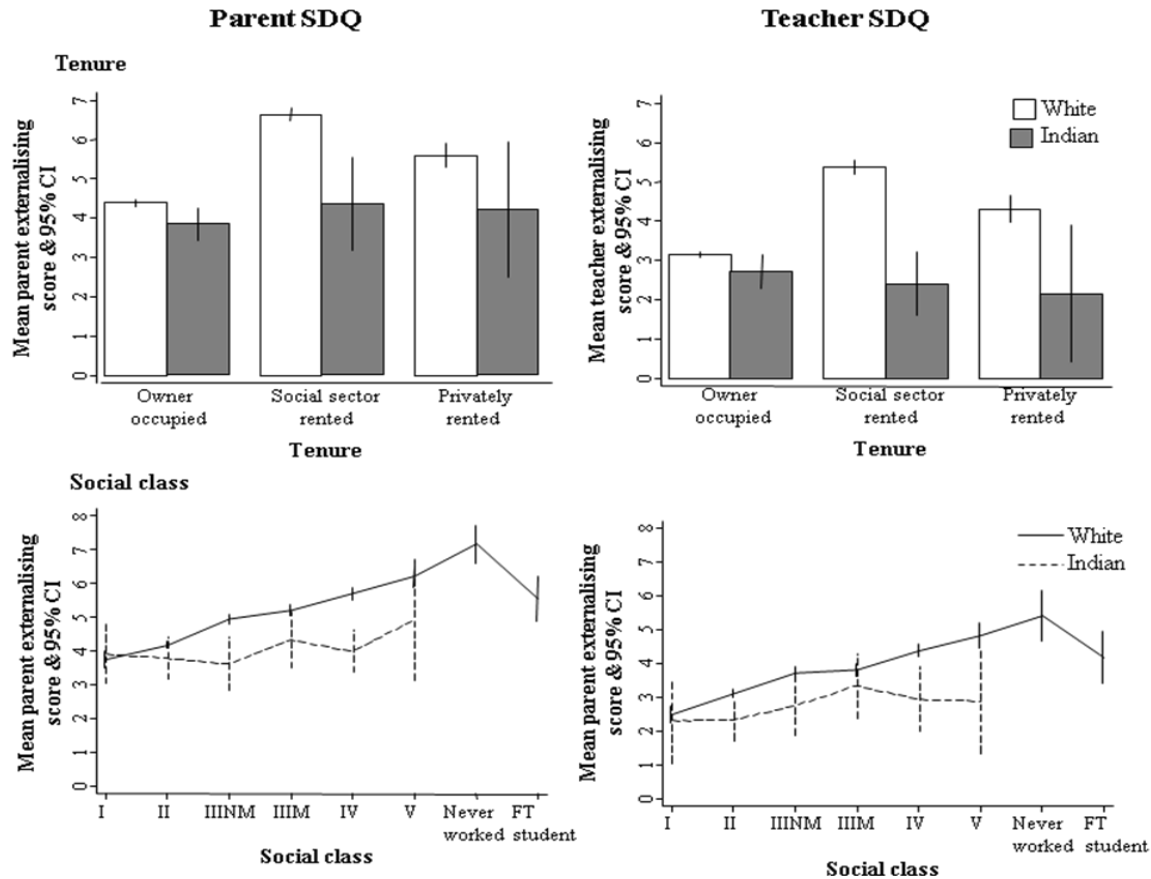
Socio-economic disadvantage: multivariable analyses

We investigated whether the interaction between ethnicity and socio-economic disadvantage persisted in multivariable models, in order to assess how far the interaction between Indian ethnicity and SEP was explained by Indians' child, family, school and area characteristics. In fact, some evidence of an interaction between ethnicity and SEP remained even after adjusting for all these variables. For example, in the final fully-adjusted model the significance of the interaction term between parent education and ethnicity was $p=0.006$ (or $p=0.03$ if education was entered as a categorical variable). Once again, the nature of this interaction was such that the marked SEP gradient in Whites was absent in Indians, and consequently the Indian advantage was greatest in the more deprived groups. This is also indicated by the stratified analyses in Table 17. As these show, the fully-adjusted regression coefficient of White (vs. Indian) ethnicity was 1.28 (95%CI 0.67, 1.90) in parents of no education, compared to 0.58 (-0.07, 1.24) in parents of GCSE-level education and 0.38 (-0.11, 0.87) in parents with A-levels or above. Moreover, this approximate three-fold difference between the bottom and the top education strata was not confined to the fully-adjusted model. Rather it was fairly constant across all the models in Table 17 – for example in the unadjusted model the point estimate was 2.04 for no education vs. 0. 63 for A-level education or above. This indicates that just as the measured characteristics of Indian children could not fully explain the overall Indian advantage, these characteristics also do not explain the flattening of the SEP gradient.

**Table 17: Ethnic differences in mean externalising SDQ score, stratified analyses by parent education**

Adjusted for:	Parent externalising score				
	Full population (13 815 White, 358 Indian)	p-value for interaction with parent education	A-level qualifications or above (4698 White, 124 Indian)	GCSE-level qualifications (6400 White, 132 Indian)	No education (2717 White, 102 Indian)
Sex, age and survey year	1.06 (0.71, 1.42)***	<0.001 (1 d.f.) / <0.001 (5.d.f.)	0.63 (0.19, 1.06)***	0.97 (0.26, 1.69)**	2.04 (1.43, 2.64)***
Plus academic abilities	0.79 (0.44, 1.13)***	<0.001 (1 d.f.) / 0.002 (5.d.f.)	0.34 (-0.12, 0.81)	0.63 (-0.04, 1.29)	1.71 (1.10, 2.31)***
Plus family type and parental divorce	0.50 (0.16, 0.83)**	0.002 (1 d.f.) / 0.01 (5.d.f.)	0.18 (-0.28, 0.64)	0.32 (-0.34, 0.98)	1.36 (0.77, 1.96)***
Plus area, school and family SEP, except parent education	0.56 (0.21, 0.92)**	0.008 (1 d.f.) / 0.04 (5.d.f.)	0.30 (-0.19, 0.79)	0.38 (-0.27, 1.03)	1.18 (0.53, 1.82)***
Plus other family composition and stress	0.66 (0.30, 1.01)***	0.01 (1 d.f.) / 0.06 (5.d.f.)	0.41 (-0.11, 0.93)	0.49 (-0.16, 1.13)	1.23 (0.58, 1.87)***
Plus other child variables	0.52 (0.16, 0.88)**	0.01 (1 d.f.) / 0.04 (5.d.f.)	0.25 (-0.25, 0.76)	0.37 (-0.28, 1.02)	1.10 (0.48, 1.73)
Plus family functioning	0.69 (0.33, 1.06)***	0.006 (1 d.f.) / 0.03 (5.d.f.)	0.38 (-0.11, 0.87)	0.58 (-0.07, 1.24) [p=0.08]	1.28 (0.67, 1.90)

*p<0.05, **p<0.01, ***p<0.001. d.f. = degrees of freedom. Table presents the regression coefficients for White (vs. Indian) ethnicity from linear regression. P-values for interaction are presented treating parent education both as a linear term (1 d.f.) and a categorical variable (5 d.f.). Note that data on parent education was missing on 56 individuals, and these individuals are excluded from these analyses.

We repeated these analyses using the teacher externalising score as the outcome and using household income and tenure as SEP indicators.[*] In all cases, there was again a trend for the Indian advantage to be largest in the least advantaged group (Figure 11). Likewise, the relative gap between the top and bottom groups was again similar in the fully adjusted model compared to the unadjusted model. In several cases, however, the interaction became only weakly significant or non-significant in the fully adjusted models. This was particularly true when using the teacher outcome, for which fewer individuals were available. This highlights the fact that these stratified analyses and tests for interaction are operating at the limits of the power offered by the B-CAMHS sample size, and therefore the need for replication in larger datasets.

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[*] These were the other two SEP indicators which showed evidence of independent predictive effects upon child mental health; see **Error! Reference source not found.**.

Figure 11: Regression coefficients from fully-adjusted model for White (vs. Indian) ethnicity, stratified by parent education, household income and housing tenure
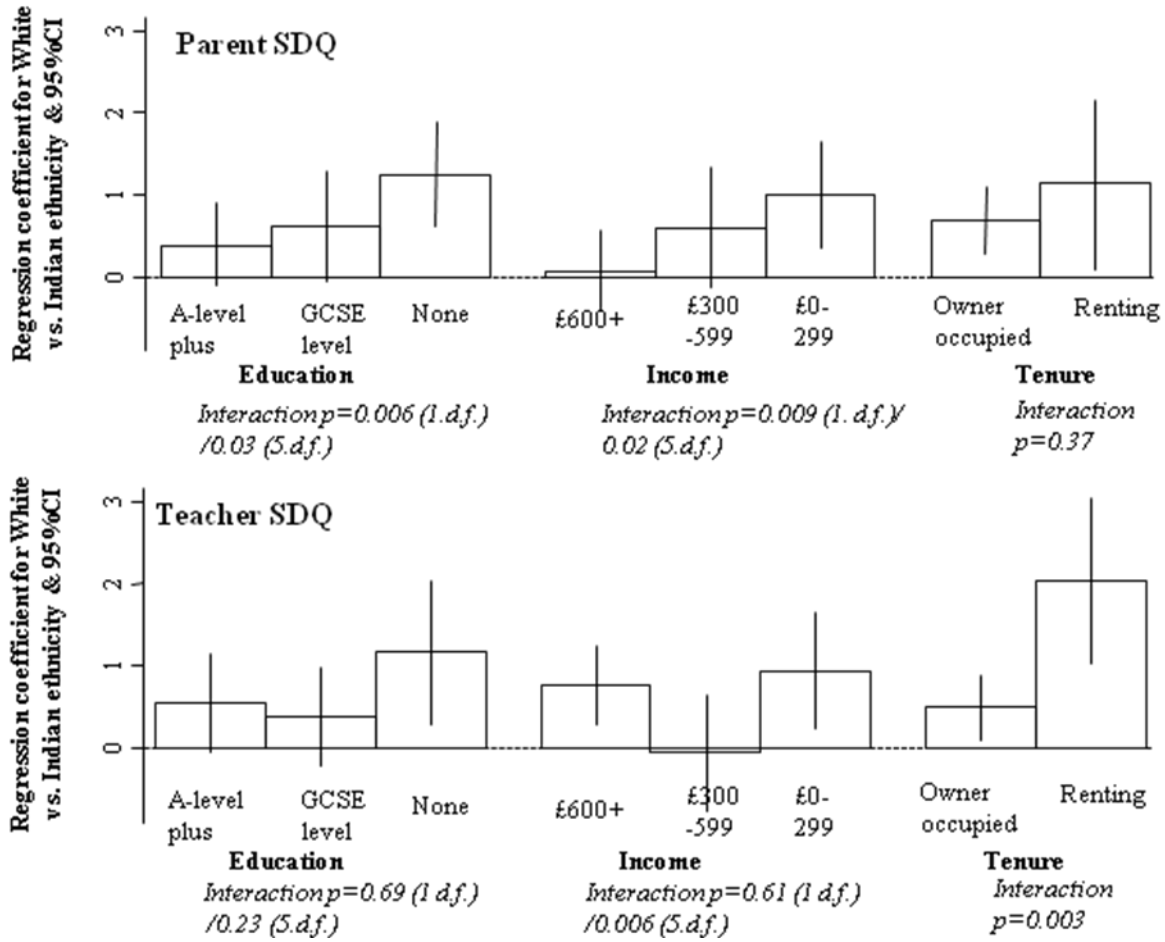
d.f. = degrees of freedom. Table presents the regression coefficients for White (vs. Indian) ethnicity from linear regression. P-values for interaction are presented treating parent education both as a linear term (1 d.f.) and a categorical variable (5 d.f.).

References to electronic appendix

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