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Socioeconomic risk, parenting during the preschool years and child health age 6 years

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Background: Parent–child relationships and parenting processes are emerging as potential life course determinants of health. Parenting is socially patterned and could be one of the factors responsible for the negative effects of social inequalities on health, both in childhood and adulthood. This study tests the hypothesis that some of the effect of socioeconomic risk on health in mid childhood is transmitted via early parenting. **Methods:** Prospective cohort study in 10 USA communities involving 1041 mother/child pairs, selected at birth at random with conditional sampling. Exposures: income, maternal education, maternal age, lone parenthood, ethnic status and objective assessments of mother child interaction in the first 4 years of life covering warmth, negativity and positive control. Outcomes: mother's report of child's health in general at 6 years. Modelling: multiple regression analyses with statistical testing of mediational processes. **Results:** All five indicators of socioeconomic status (SES) were correlated with all three measures of parenting, such that low SES was associated with poor parenting. Among the measures of parenting maternal warmth was independently predictive of future health, and among the socioeconomic variables maternal education, partner presence and 'other ethnic group' proved predictive. Measures of parenting significantly mediated the impact of measures of SES on child health. **Conclusions:** Parenting mediates some, but not all of the detectable effects of socioeconomic risk on health in childhood. As part of a package of measures that address other determinants, interventions to support parenting are likely to make a useful contribution to reducing childhood inequalities in health.

Keywords: childhood health, longitudinal, parent–child relations, social inequalities

Parenting processes and parent–child relationships influence multiple aspects of children's development.^{1–4} Life-course studies suggest that they may also affect the mental and physical health of offspring in adulthood.^{5–7} Aspects of parenting that have emerged as influential include warmth, support, control, hostility, negativity, conflict and discipline.

Parenting is socially patterned,^{8,9} and could be one of the factors responsible for the deleterious effects of childhood poverty and low socioeconomic status (SES) on health in childhood^{10,11} and beyond.¹² Were this the case, parenting would represent one possible avenue for intervention in combating social inequalities across the life course, alongside efforts to address financial stressors, poor nutrition, schooling, neighbourhoods and housing.

Life-course studies often rely on retrospective reporting of childhood circumstances and may rely on poorly validated measures of parenting.^{6,7,13} Investigation of the impact of parenting and social inequalities on health could, therefore, benefit from studies conducted during childhood when objective measurements of parenting are possible. Current studies using such measures show parenting to predict chronic illness in 2 year olds,¹⁴ poor health in 5 year olds,¹⁵ and symptoms of physical illness in adolescents.¹⁶ These studies deal with the possible confounding or mediating effects of SES with varying degrees of sophistication.

A large scale study² tracking over 1000 healthy babies through the first 6 years of life, obtaining multiple measurements of parenting and socioeconomic circumstances afforded the opportunity to test the hypothesis that parenting mediates the effect of socioeconomic circumstances on 6 year olds' health.

Methods

Overview of the study

Data were collected as part of the common protocol during the first 6 years of the National Institutes of Child Health and Human Development (NICHD) Study of Early Child Care (SECC), a longitudinal study initiated by (NICHD) in 1989 to answer questions about relations between child care experiences and children's development (NICHD Early Child Care Research Network, 2005).

Participants

Ten research sites recruited participants from 31 hospitals located in or near Little Rock, AR; Irvine, CA; Lawrence, KS; Wellesley, MA; Philadelphia, PA; Pittsburgh, PA; Morganton, NC; Charlottesville, VA; Seattle, WA and Madison, WI. During the selected 24-h periods in the first 11 months of 1991, all women giving birth were screened for eligibility. Exclusions were: mothers younger than 18, multiple births, medical complications of mother/baby, an expected relocation within the year, adoption plans and a lack of English fluency. Of the 8986 mothers screened, 5416 (60%) were eligible and agreed to a 2-week phone call.

A conditionally random sample of 3015 mothers (56%) was selected from these 5416 women, insuring representation (at least 10% marginally) of single parent households,

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mothers who did not graduate from secondary school, and ethnic minority mothers. These mothers were called (up to 3 times) and 1526 (51%) agreed to a 1-month interview, 1364 of whom completed the interview and became study participants. This final sample included 52% male and 24% minority ethnic children. 4.5% of the mothers had not completed secondary school, and 14% were lone parents when the child was born.

After exclusion of those with missing data, 1041 of the 1364 subjects were included in the current study. These 1041 participants averaged more years of maternal education (14.49 vs. 14.23) and higher annual family income-to-needs ratios (3.49 vs. 3.40; (see definition given subsequently). Included children were less likely to be from lone-parent families (14% vs. 16%) and more likely to be European American (81.2 vs. 79.0%).

Socioeconomic status measures

At enrolment, mothers reported their years of education (range: 7–21), the child's race (white, black, Hispanic and other) and, when children were 1, 6, 15, 24, 36 and 54 months of age, their lone-parent status and annual family income. Income was divided by the US Census poverty threshold for a given size family at that time, yielding an income-to-needs ratio which was averaged across data collection points and transformed to give a mean of 0 and variance of 1 (range: –1.10 to 6.42); a ratio ≤ 1.0 is regarded as 'poor' and of 2.0 'near poor'. Measurement occasions on which a partner lived with mother were summed to create the variable 'partner presence' (range: 0–6).

Parenting measurements

Measures of parenting were drawn from a series of age-appropriate, validated, videotaped semi-structured interaction tasks^{2,17,18} at 6, 15, 24, 36 and 54 months and from the Home Observation for Measurement of the Environment (HOME) Inventory¹⁹ administered at the same ages with the exception of 24 months. During the interaction tasks, mothers were asked to play with their infants for 15 min with and without (6 months only) toys. Videotapes were coded by raters blind to other information about the child/family and inter-coder reliability on 20% of tapes showed intra-class correlations exceeding 0.80 for all measures. The Infant–Toddler version of HOME was used at 6 and 15 months and the Early Childhood version at 36 and 54 months. Average agreement at each site was >0.90 for each time of measurement. Using these data, three measures of parenting (warmth, negativity and positive control) were created by averaging scores across ages on the composite variables as described subsequently.

Warmth

At 6 and at 15 months warmth was operationalized as the mean of 4-point video ratings (1 = not characteristic at all; 4 = very characteristic) of *sensitivity to the child when not distressed* (i.e. supportive of child's goals and desires/not intrusive) and *positive regard* for the child (i.e. expression of affection and pleasure), and the (7-point) HOME *responsivity* rating (i.e. appropriateness and timeliness of responsiveness to child bids for attention). At 24 months only (the same) videotape ratings were available for averaging. At 36 and at 54 months a 7-point video rating of *nurturing guidance* (i.e. emotionally supportive explaining/encouraging) was averaged with the HOME responsivity rating.

Negativity

At 6 and at 15 months a 4-point video rating of *negative regard* (e.g. criticism/hostility/annoyance) was averaged with

the 4-point HOME *harshness* rating (i.e. maternal anger/annoyance/physical punishment). At 24 months only, the video *negative regard* rating was available. At 36 and at 54 months, a 7-point rating of maternal *rejecting behaviour* was averaged with the HOME *harshness* score.

Positive control

Only one score was available at each of the following ages. At 24 months, positive control was measured by a (reverse scored) 4-point rating of mother's intrusive/overcontrolling behaviour; at 36 months, by a 7-point rating of maternal respect for child's initiatives and ideas; and at 54 months, by the (reverse-scored) HOME harsh control (i.e. dominating) rating.

Child general health measure

In the fall and spring of first grade when children were 6.6 and 7.0 years of age, respectively, mothers rated the child's overall health using a 4-point scale (1 = poor, 2 = fair, 3 = good, 4 = excellent); the two ratings were summed so that higher scores reflected better health (mean: 6.93, SD: 1.07, range: 2–8).

Statistical modeling

Pearson correlations highlighted associations between socioeconomic, parenting and child health variables. Ordinary least-squares regression assessed the predictive power of socioeconomic and parenting variables on health. Hierarchical regression analysis evaluated the degree to which socioeconomic variables collectively predicted child health adjusting for parenting variables. To assess the impact of the non-normal and non-interval nature of the outcome variable, we repeated the analyses using logistic regression distinguishing children whose health was excellent at least once and good or excellent at both points (39%) from those with poorer health (61%). The extent to which parenting variables mediated the impact of socioeconomic variables on child health was tested using the evidentiary standards of mediation proposed by Baron and Kenny.²⁰ They suggest that a variable (*M*) e.g. parenting, may be considered a mediator for the effect of an independent variable (*X*) e.g. SES, on an independent variable (*Y*) e.g. child health, if *X* has a significant effect on both *M* and *Y* and the effect of *X* on *Y* is significantly affected by the addition of *M*. We tested the significance of this effect for each parenting variable individually (single mediator analysis) using the method due to Sobel.²¹ In the multiple mediator analysis (when all parenting variables were entered simultaneously) we used the method proposed by Preacher and Hayes²² in which the standard error for the change in the effect of *X* on *Y* is obtained through bootstrap sampling.

Results

Table 1 presents the bivariate correlations showing that health age 6 years was poorer when families had less income ($r = 0.15$), mothers had less education ($r = 0.20$), were younger ($r = 0.16$) or black ($r = -0.07$). Spouse/partner presence proved unrelated to child health, as was Hispanic or 'other' ethnicity. Health was better in children experiencing more warmth (0.16) and positive control (0.14) and worse when experiencing more negativity (-0.14). The level of correlation between SES factors and health, and between parenting variables and health was similar. The three parenting variables were highly correlated (0.58–0.71). Greater income, more years of maternal education, greater maternal age and more occasions residing with a partner predicted better parenting (more warmth/positive control, less negativity). White mothers

Table 1 Pearson correlation coefficients for socioeconomic, parenting and child health variables

	Inc/needs ratio	Mother's education	Mother's age	Partner presence	Hispanic	Black	White	Other	Warmth	Positive control	Negativity	General health
Inc/needs ratio		0.55**	0.46**	0.35**	-0.05	-0.26**	0.23**	0.01	0.45**	0.37**	-0.33**	0.15**
Mother's education			0.52**	0.32**	-0.09**	-0.22**	0.20**	0.06*	0.48**	0.44**	-0.42**	0.20**
Mother's age				0.36**	-0.05	-0.27**	0.25**	-0.01	0.41**	0.35**	-0.38**	0.16**
Partner presence					0.01	-0.41**	0.33**	0.00	0.43**	0.35**	-0.33**	0.04
Hispanic									-0.06	-0.04	-0.02	-0.02
Black									-0.41**	-0.38**	0.31**	-0.07*
White									0.37**	0.35**	-0.25**	0.09**
Other ^a									-0.02	-0.04	0.01	-0.05
Warmth										0.58**	-0.55**	0.16**
Positive control											-0.71**	0.14**
Negativity												-0.14**
General health												

* $P < 0.05$; ** $P < 0.01$

a: 'Other' included Asian and American Indian ethnic groups together with all other ethnic groups

Table 2 Impact of SES factors combined on individual parenting variables: showing unstandardized coefficients (B) and standard errors (SE), and standardized coefficients (B)

Socioeconomic status	Maternal warmth		Maternal negativity		Positive control	
	B (SE)	B	B (SE)	B	B (SE)	B
Inc/needs ratio	0.082 (0.016)	0.156***	-0.028 (0.020)	-0.048	0.068 (0.026)	0.085*
Mother's education	0.112 (0.015)	0.243***	-0.135 (0.018)	-0.258***	0.192 (0.024)	0.273***
Mother's age	0.007 (0.002)	0.089**	-0.013 (0.003)	-0.145***	0.007 (0.004)	0.052
Partner presence	0.096 (0.015)	0.175***	-0.071 (0.019)	-0.115***	0.098 (0.025)	0.117***
Hispanic ^a	-0.097 (0.055)	-0.043	-0.102 (0.068)	-0.040	-0.098 (0.089)	-0.029
Black ^a	-0.319 (0.039)	-0.222***	0.245 (0.048)	0.151***	-0.536 (0.063)	-0.245***
Other ^{a,b}	-0.131 (0.066)	-0.048*	0.106 (0.082)	0.035	-0.303 (0.107)	-0.074**
R ²	0.394***		0.267***		0.308***	

a: The White group was used as the reference category so was not included in the regression

b: 'Other' included Asian and American Indian ethnic groups together with all other ethnic groups

* $P < 0.05$; ** $P < 0.01$; *** $P = 0.000$

exhibited more warmth and positive control and less negativity and black mothers the reverse.

SES variables were regressed onto the three parenting variables individually and accounted for 39.4, 26.7 and 30.8% of variance in warmth, negativity and positive control, respectively (table 2). Income/needs ratio, maternal education, maternal age, partner presence and black and 'other' ethnicity contributed uniquely to the prediction of warmth. Maternal education and age, partner presence and black ethnicity uniquely predicted negativity. Income/needs ratio, maternal education, partner presence and black and 'other' ethnicity uniquely predicted positive control.

Table 3 presents the results of regression models for the combined impact of SES variables on child health, (Model 1a), then for the combined impact of parenting variables on child health (Model 1b) and finally for SES and parenting variables combined (Model 2). SES factors collectively accounted for 5.2% variance in children's health, with maternal education and the 'other' ethnicity making significant unique contributions. Maternal warmth proved to be the more important independent predictor among the three parenting variables that together accounted for 3.1% of the variance. In Model 2, parenting variables did not prove to be significant predictors

of child health independent of SES factors; mother's education and 'other' ethnicity remained predictive and a significant effect of partner presence emerged. The β coefficients for all SES factors other than partner presence (for which an increase was observed) were lower in Model 2 than in Model 1a. The pattern of results was the same in the logistic regression analysis with child health as a dichotomous outcome (not shown).

Table 3 also presents the level of significance for the change in β coefficient for each SES variable between Models 1a and 2 using the method of Preacher and Hayes. The change in β s when parenting variables were included was significant for income-to-needs ratio, mother's education and age, partner presence and black ethnicity. Applying the Sobel test to each parenting variable individually showed the reduction to be largely attributable to the effect of maternal warmth, with no significant changes in β s due to the inclusion of positive control or negativity.

Discussion

Our results indicate that socioeconomic variables were significantly correlated with parenting variables (tables 1

Table 3 Impact of SES factors (Model 1a), parenting variables (Model 1b) and SES and parenting variables combined (Model 2) on child health age 6–7 years: showing unstandardized coefficients (B) and standard errors (SE) and standardized coefficients (B) and *P*-values for change in *B* between Models 1a and 2.

Predictors	Model 1a <i>B</i> (SE) Standardized <i>B</i>	Model 1b <i>B</i> (SE) Standardized <i>B</i>	Model 2 <i>B</i> (SE) Standardized <i>B</i>	Sobel test ^c <i>P</i> -value (95% CI)
Income	0.06 (0.05) 0.05		0.04 (0.05) 0.04	0.04 (0.002, 0.04)
Mother's education	0.17 (0.04)*** 0.16		0.14 (0.05)** 0.13	0.02 (0.002, 0.02)
Mothers age	0.01 (0.01) 0.06		0.01 (0.05) 0.05	0.05 (0.00, 0.105)
Partner presence	−0.09 (0.05) −0.07		−0.11 (0.05)* −0.08	0.02 (0.004, 0.045)
Hispanic ^a	−0.03 (0.16) −0.01		−0.02 (0.163) −0.004	0.66 (−0.06, 0.04)
Black ^a	−0.11 (0.12) −0.03		−0.04 (0.12) −0.01	0.04 (−0.16, −0.06)
Other ^{a,b}	−0.42 (0.19) −0.07*		−0.39 (0.12)* −0.06	0.15 (−0.09, 0.01)
ΔR ²	0.052***			
Warmth		0.27 (0.09) 0.11**	0.16 (0.10) 0.07	
Negativity		−0.13 (0.09) −0.06	−0.08 (0.09) −0.04	
Positive control		0.04 (0.07) 0.03	0.00 (0.07) 0.00	
ΔR ²		0.031***	0.058***	

a: The White group was used as the reference category so was not included in the regression

b: 'Other' included Asian and American Indian ethnic groups together with all other ethnic groups

c: 95% confidence intervals and *P*-values for the reduction in β after adjustment for three parenting variables based on 10 000 bootstrap samples
P* < 0.05; *P* < 0.01; ****P* = 0.000

and 2) and with child health and that parenting variables collectively reduced the predictive power of most SES variables on child health (table 3). These results fulfil the evidentiary standards for mediation,²⁰ suggesting that parenting is a partial mediator of the impact of SES factors on child health. The tested hypothesis was therefore confirmed, at least as it pertains to socioeconomic status and parenting in the preschool period and health in the early school years. Comparison of the proportion of variability explained by Models 1b and 2 suggests that parenting could mediate up to half of the effect of SES on child health.

The measures of parenting are likely to be robust. No other studies of the impact of parenting on health are based on objective measures made on up to five separate occasions during the pre-school years. The measures of SES, particularly the income-to-needs ratio, are also derived from careful questioning on multiple occasions. The measurement of children's health, however, is based on two maternal reports of 'health in general', and thus represents the least robust aspect of the study. Regression modelling assumes a normally distributed, interval scale, a condition not fulfilled by this variable. The fact that our results reported were replicated in logistic regression modelling with categorical scoring of child health suggests that the OLS regression findings are robust. Whilst fulfilling the function of a generic measure, maternal report of child health raises the possibility of confounding by, for example, maternal perception of illness severity with her own mental health status. Studies examining the correlation between physician and mother reported child health, however, indicate that the measure is valid,¹¹ and a further study suggests negligible influence of maternal mental health on reporting of child health.²³ In this cohort children's general health was strongly negatively correlated with the experience of infections (e.g. ear, intestinal and respiratory) and chronic health problems (e.g. asthma, allergies) and covaried meaningfully with children's day-care experience.²

Our findings need to be interpreted in the light of participant inclusion criteria and non-random attrition of participants. Although sampling ensured good representation of single mothers, those with limited education and ethnic minorities, some groups were selectively excluded, including teenage parents, children with medical problems, pre-term births, non-English speaking families and families likely to relocate with a year of the child's birth; moreover, attrition was higher among the disadvantaged. Thus, although the cohort is by no means advantaged, in that almost one in five families were of minority ethnic groups, 14% single parent families and almost 5% had not completed high school, the final sample is somewhat advantaged relative to the entire US population and to the originally recruited sample. Whilst our results therefore pertain to the majority of the population, they do not cover the most disadvantaged families among whom supportive parenting is likely to be least common.^{9,10} If the predictions we observed in this study pertain to the latter group as well as those we studied, our results may underestimate the impact of parenting on population health and its role in mediating the overall impact of socioeconomic risk. Our findings may also represent a conservative estimate, because they focus only on mothers' parenting and studies examining the impact of parenting on adult health show the paternal relationship to be an independent and, in some studies, more significant predictor than the maternal relationship.⁶

The nature of recruitment to this cohort means that it does not include babies who were sick or disabled at birth. The cohort is thus healthy relative to the general population. Although measures of parenting were made from 6 months of age, it is possible that poor health developing between birth and 6 months of age might have played a part in determining parenting. Whilst the possibility of such reverse causation, cannot be entirely excluded, the short time between birth and the first measure of parenting, and the relative rarity of health problems

arising *de novo* at this time, make this an unlikely explanation of our results.

Our results were consistent with those of studies suggesting that parenting is a mediator of the impact of socioeconomic factors on other outcomes of importance for children: mental health, delinquency and educational achievement.^{24–26} Potential mechanisms by which suboptimal parenting might influence health in general include psychosocial and biological pathways⁵, both possibly mediated via the hypothalamic-pituitary-adrenal response to stress.²⁷ This response appears to be especially susceptible to suboptimal parent–child relationships in early life.²⁸ The range of possible explanatory factors we examined is, however, limited and it is possible that other factors such as birth weight, breast feeding, passive smoking and nutrition could play a part and should be considered in further studies.

Because of the nature of the analyses carried out, it may be mistaken to ascribe exclusive importance to maternal warmth, which emerged as the sole significant predictor of health in the regression analysis presented in table 3 and the dominant variable in the mediation analyses, while concluding that other dimensions of parenting are of little importance to children's physical well being. Because of the high level of correlation between the parenting variables, warmth may have emerged as the sole significant main-effect predictor of health in the multivariate analysis for statistical reasons, rather than because there is something uniquely important about this aspect of mothering.

In the same way, although among the socioeconomic and demographic risk factors, maternal education proved to be the most important predictor of child health, this does not prove that income and maternal age play no part in determining children's health. Although not correlated with health in univariate analyses (table 1), two social factors—being a member of an 'other' ethnic group (predominantly native American or Asian Indian) and partner presence in the house—became independently though, if weakly, predictive of poor health in the final models. Taking parenting and other socioeconomic factors into account thus increased the predictive power of these variables, implying that their impact on child health, like that of maternal education, is not entirely mediated by either parenting or other SES factors. Our counter intuitive finding that partner presence negatively predicted child health, once parenting and other SES factors had been taken into account needs validation in other studies. In particular, it could be important to distinguish between biological fathers and unrelated partners.

The combined effects of parenting and SES factors were by no means large and the general health measure reflects predominantly self-limiting, non-life-threatening conditions. A small increase in risk of a common problem applied to a large proportion of the population can, however, be significant in terms of health care provision and quality of life. As the physiological mechanisms likely to underlie these health effects are pertinent across the life course where they have potential implications for the common causes of premature mortality, these findings have wider implications for public health.

The most important conclusion from this study involves its implications for programmes to combat the influence of social inequalities in health operating throughout the life course. They imply that parents who are able to maintain positive parenting in the face of social deprivation can protect their children from some of the deleterious effects of poverty on health. Whilst interventions to support parenting that have been shown to be effective in enabling parents to change^{29–32} will not be sufficient on their own, it is likely that

they will prove important as part of any package of measures adopted to reduce the impact of childhood social inequalities on health.

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Conflict of interest: None declared.

Key points

- Parent–child relationships and parenting processes are potential life-course determinants of health.
- Parenting is socially patterned and could be one of the factors responsible for the impact of social inequalities on health.
- In this cohort parenting mediated 50% of the impact of socioeconomic determinants on child health.
- Interventions to improve parenting are likely to be an important part of any package of measures designed to reduce inequalities in health.

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