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What predicts persistent early conduct problems? Evidence from the Growing Up in Scotland cohort

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ABSTRACT

Background There is a strong case for early identification of factors predicting life-course-persistent conduct disorder. The authors aimed to identify factors associated with repeated parental reports of preschool conduct problems.

Method Nested case–control study of Scottish children who had behavioural data reported by parents at 3, 4 and 5 years.

Results 79 children had abnormal conduct scores at all three time points ('persistent conduct problems') and 434 at one or two points ('inconsistent conduct problems'). 1557 children never had abnormal scores. Compared with children with no conduct problems, children with reported problems were significantly more likely to have mothers who smoked during pregnancy. They were less likely to be living with both parents and more likely to be in poor general health, to have difficulty being understood, to have a parent who agrees that smacking is sometimes necessary and to be taken to visit other people with children rarely. The results for children with persistent and inconsistent conduct problems were similar, but associations with poverty and maternal smoking were significantly less strong in the inconsistent group.

Conclusion These factors may be valuable in early identification of risk of major social difficulties.

INTRODUCTION

There is an increasingly strong case for screening preschool children for conduct disorder (CD),[1] particularly 'life-course-persistent' CD,[2] which emerges in early life and persists into adulthood with major adverse social, physical and health consequences. Difficulties present early in life are often predictive of behavioural problems and other negative health outcomes at later stages of childhood, adolescence and beyond.[3–6] Furthermore, there are effective interventions for preschool children with behaviour problems, which can reduce the risk of developing more serious psychopathology.[7 8] The main weakness in the argument for screening lies in the lack of a sufficiently sensitive and specific screening test for use with preschool children.[1]

Some data are available on predictors of CD during early childhood. The Copenhagen Child Cohort Study [9] used combined contemporaneous questionnaire scores from parents and teachers of 5–7-year-old children and, using a multivariable model, found that male sex, extreme prematurity, young maternal age, low household income at the time of birth and the child living without any biological parents or with a single parent in the first year of life predicted likely psychopathology.

Murray *et al*[10] recently summarised available data from cohort studies predicting conduct problems and crime. Their new analysis used data from the 1970 British Cohort Study on pregnancy and birth, and child, parent and socioeconomic characteristics at age 5. Conduct problems were reported by parents at age 10, and criminal convictions were self-reported by study members at age 30. Among pregnancy and birth measures, only prenatal maternal smoking was strongly predictive of conduct problems and criminal conviction. There were, however, several strong psychosocial risk factors identifiable during the preschool period (up to age 5): parental loss, low cognitive stimulation, maternal depression, having a teenage mother or single mother at birth and living in a large family or poor neighbourhood.

In identifying predictors of life-course-persistent CD, we require both robust early assessment data, available only in a few cohort studies,[11] and evidence of longitudinal stability of children's difficulties. The Growing Up in Scotland (GUS) study (http://www.growingupinscotland.org.uk) is a recent source of data describing factors involved in children's social, emotional and behavioural development up to entry to primary school—usually around age 5 in Scotland. The Strengths and Difficulties Questionnaire (SDQ)[12–14] was completed at ages 3, 4 and 5 years for all GUS participants. This 25-item questionnaire (http://www.sdqinfo.org) is a very widely used screening tool for psychiatric disorder in children aged 3–16 years. It can be completed by parents or teachers of young children, and it is the parent-reported version that is described here. A systematic review of studies comparing SDQ scale scores with psychiatric diagnosis[15] reported that parent-reported versions of the SDQ conduct problems subscale have sensitivity of 0.75 and specificity of 0.91 for the detection of CDs. The outcome of interest in the present paper is persistently abnormal conduct scores at ages 34, 46 and 58 months, which we believe may be a good proxy for life-course-persistent CD. Future waves of data may allow this conjecture to be further tested using a range of modelling approaches to CD trajectories over time.[16 17]

This study aims to identify predictors of CD by assessing associations between persistently abnormal SDQ conduct problem scores with characteristics drawn from candidate predictors in the published literature.

METHODS

The Growing Up in Scotland study

We analysed data from the families who completed the first four sweeps (2005/2006 to 2008/2009) of the 'child cohort' of GUS. Focusing initially on a cohort of 2859 children aged 2–3 years, the first wave of fieldwork began in April 2005 and annual data collection has been undertaken since that time.

The study population was derived from child benefit records (at that time around 97% of eligible families were in receipt of this benefit in Scotland). Stratified cluster sampling was used to derive a nationally representative sample. Primary sampling units (PSUs) were first created by aggregating data zones (small, relatively socially homogeneous, geographical areas of adjacent postcodes with 500–1000 residents) in order to give an average of 57 births per sampling unit per year based on the previous 3 years birth rates in the relevant data zones. PSUs were then stratified according to local authority area and then Scottish Index of Multiple Deprivation score. One hundred and thirty PSUs were then randomly selected across strata to ensure a representative mix of areas in terms of socioeconomic status and local authorities.

SDQ[14] data were obtained via parental report, normally from the mother, in the computer-assisted self-completion module of the interview. Three sets of data were available, measured at ages 34, 46 and 58 months. SDQ data were processed using the standard algorithm for parent-completed questionnaires provided at the website (http://www.sdqinfo.org). The SDQ scores were dichotomised, with a value of 4 or more being considered abnormal and indicative of possible CD. Then, three groups of children were defined according to whether they had abnormal SDQ conduct scores on: none, some or all three of the occasions. This three-way classification was used as our principal outcome variable and we refer to the groups below as: 'never', 'inconsistent' and 'persistent' conduct problems.

Statistical methods

Unless otherwise stated, all items were measured at the first contact when the cohort child was aged around 34 months. Numbers (except those reflecting the actual number of children belonging to each CD category) were weighted to adjust for non-response and sample selection.

Tables were created in SPSS V.18 using the Complex Samples module and the regression analyses were run in Stata using the survey (svy) command. Both sets of commands generate robust SEs that take sample design features, such as clustering, into account. The commands identify the sample clusters; the between- and within-cluster variances are then used to generate robust SEs.

A multinomial logistic model was used for the principal analysis. The never abnormal group was chosen as the reference category, and the results are presented as two sets of ORs: one contrasting the inconsistently abnormal group with the never abnormal group and the other contrasting the persistent group with the never abnormal group. Similar results, in terms of ORs, would be obtained by fitting two binary logistic models, and it may be convenient to interpret the results as such. The multinomial model nevertheless has the advantage of being more efficient and hence yielding narrower CIs.[18] A more parsimonious ordinal logistic model was also tested, but the proportional odds assumption that underlies it was not tenable and so the results from the multinomial model were retained. Unadjusted ORs were estimated without controlling for other variables. All variables with sufficient numbers of cases were then included in a multivariable model to produce the adjusted ORs.

Ethics approval

The initial sweep of data collection was subject to medical ethical review by the Scotland 'A' MREC committee (application reference: 04/M RE 1 0/59). Subsequent annual sweeps have been reviewed via substantial amendment submitted to the same committee.

RESULTS

Our sample was restricted to those 2070 cases with valid SDQ conduct subscale scores at each sweep of data collection (34, 46 and 58 months)—72.2% of the cohort as a whole. Numbers of children with abnormal conduct scale scores at each data collection point are shown in table 1.

Table 2 gives univariate comparisons of the characteristics of the children with persistent conduct problems and those with inconsistent conduct problems, and their families, with the children who did not have abnormal scores at any time. The multinomial model, adjusted for all variables, is also presented here. Variables are described in online appendix 1.

The interaction can be interpreted in terms of ORs, which compare the four groups defined by maternal smoking during pregnancy and household income. Taking the mothers who had higher income and did not smoke during pregnancy as the reference group, the ORs for inconsistent and persistent conduct problems, respectively (compared with no conduct problems) are: for higher income with antenatal smoking 1.52 vs 5.02; for low income without antenatal smoking 1.34 vs 4.33 and for low income with antenatal smoking 1.77 vs 4.47.

Analysis using the unweighted data yielded very similar results, and the data are available from the corresponding author on request.

As noted above, the analysis was also undertaken using ordinal logistic regression methods, which treat the outcome variable (no conduct problems, inconsistent problems, persistent problems) as ordered. The Brant test for proportional odds[19] indicated that the assumptions required for the ordinal model were violated and so the results are not presented in detail here. In brief, the association between maternal smoking during pregnancy, living in a family in the lowest income quintile and the interaction between maternal smoking and low income was shown to be significantly different for children in the persistent group compared with those in the inconsistent group.

DISCUSSION

We identified 79 children with abnormal conduct scores at ages 3, 4 and 5 years: 4.3% of the whole cohort, and 434 (22.5%) children

Table 1 Patterns of prevalence of abnormal scores on the SDQ conduct subscale over time

'Abnormal' score on SDQ at:					
34 months	46 months	58 months	Unweighted number	Weighted number	Per cent of whole cohort with valid data
No	No	No	1557	1510	73.1
No	No	Yes	72	74	3.6
No	Yes	No	98	104	5
No	Yes	Yes	46	52	2.5
Yes	No	No	126	132	6.4
Yes	No	Yes	45	47	2.3
Yes	Yes	No	47	56	2.7
Yes	Yes	Yes	79	90	4.3
			2070	2065	100

Conduct scores ranged from 0 to 10, scores in the 'abnormal' range being ≥4 (www.sdqinfo.org/py/doc/c0.py).
SDQ, Strengths and Difficulties Questionnaire.

Table 2 Occurrence of persistent abnormal conduct score by child and family characteristics

	N (%) persistent abnormal conduct score	N (%) inconsistent abnormal conduct score	N (%) never having abnormal conduct scores	Unadjusted ORs and CI		Adjusted ORs and CI	
				Inconsistent versus never	Persistent versus never	Inconsistent versus never	Persistent versus never
Sex of child							
Male	48 (5)	236 (24)	769 (71)				
Female	31 (4)	198 (21)	788 (75)	0.82 (0.65 to 1.03)	0.67 (0.43 to 1.04)	0.89 (0.68 to 1.14)	0.77 (0.44 to 1.35)
Ethnicity of respondent							
White	78 (4)	420 (22)	1514 (73)				
Other ethnicity	1 (2)	13 (24)	42 (74)	1.05 (0.49 to 2.25)	0.43 (0.06 to 2.99)	Dropped	Dropped
Maternal age at child's birth							
25 years or older	49 (3)	317 (20)	1291 (77)				
Younger than 25 years	26 (7)	114 (31)	247 (62)	1.91 (1.52 to 2.41)	2.6 (1.57 to 4.29)	**1.38 (1.05 to 1.83)**	1.38 (0.76 to 2.5)
No. of children in household							
One	20 (4)	123 (20)	521 (76)				
Two	41 (5)	205 (23)	715 (72)	1.19 (0.91 to 1.56)	1.4 (0.78 to 2.51)	**1.42 (1.08 to 1.87)**	1.47 (0.74 to 2.93)
Three or more	18 (5)	106 (25)	321 (71)	1.3 (0.92 to 1.82)	1.37 (0.76 to 2.48)	1.3 (0.87 to 1.92)	0.90 (0.41 to 2.01)
No. of natural parents in household							
Two	43 (3)	302 (34)	1319 (78)				
One or none	36 (9)	132 (19)	238 (58)	2.44 (1.89 to 3.15)	4.25 (2.81 to 6.42)	**1.68 (1.13 to 2.51)**	**1.82 (1.12 to 2.94)**
Household income (quintiles)							
Other (≥£8410)	46 (3)	303 (20)	1262 (77)				
Bottom (<£8410)	25 (9)	94 (35)	154 (56)	2.37 (1.78 to 3.16)	3.98 (2.37 to 6.68)	1.34 (0.77 to 2.34)	**4.33 (1.72 to 10.9)**
Child's general health							
Very good or good	65 (4)	400 (22)	1502 (75)				
Fair, bad or very bad	14 (15)	34 (35)	55 (50)	2.44 (1.59 to 3.75)	6.04 (3.13 to 11.67)	**1.75 (1.1 to 2.78)**	2.41 (0.9 to 6.42)
Low birth weight							
No	68 (4)	403 (22)	1467 (74)				
Yes	9 (8)	28 (25)	86 (67)	1.21 (0.79 to 1.87)	2.21 (1.09 to 4.47)	1.1 (0.67 to 1.78)	1.28 (0.56 to 2.94)
No. of missed developmental milestones							
None or one	14 (3)	122 (21)	464 (76)				
Two or more	38 (5)	192 (26)	598 (69)	1.35 (0.97 to 1.87)	2.23 (1.16 to 4.28)	1.18 (0.83 to 1.67)	1.78 (0.81 to 3.94)
Information missing	27 (5)	120 (20)	495 (75)	0.95 (0.7 to 1.29)	1.97 (0.96 to 4.05)	0.86 (0.6 to 1.23)	1.39 (0.6 to 3.2)
Child had some difficulty being understood							
No	41 (3)	263 (19)	1141 (77)				
Yes	38 (6)	171 (29)	416 (64)	1.85 (1.45 to 2.34)	2.36 (1.47 to 3.79)	**1.61 (1.24 to 2.08)**	1.73 (0.92 to 3.25)
Maternal smoking during pregnancy							
No	34 (3)	288 (20)	1233 (78)				
Yes	40 (9)	136 (30)	293 (61)	1.94 (1.54 to 2.45)	4.28 (2.63 to 6.95)	**1.52 (1.08 to 2.15)**	**5.02 (2.6 to 9.71)**
Agree that smacking is sometimes the only thing that will work							
No	35 (3)	231 (20)	941 (77)				
Yes	44 (6)	203 (26)	616 (68)	1.42 (1.12 to 1.79)	2.03 (1.22 to 3.37)	**1.28 (1.00 to 1.64)**	1.81 (0.98 to 3.31)
Frequency child taken to visit other people with children							
Fortnightly or more often	52 (4)	318 (21)	1250 (75)				
Less often or never	27 (7)	115 (28)	305 (65)	1.54 (1.23 to 1.93)	2.3 (1.36 to 3.88)	**1.41 (1.09 to 1.81)**	**2.09 (1.13 to 3.85)**
Frequency child is read to							
Daily	52 (3)	318 (21)	1250 (76)				
Less often	27 (9)	115 (31)	305 (60)	1.87 (1.35 to 2.59)	3.43 (2.1 to 5.58)	1.34 (0.94 to 1.92)	1.74 (0.86 to 3.54)
Maternal smoking during pregnancy × household income	–	–	–	–	–	0.87 (0.4 to 1.87)	**0.21 (0.06 to 0.76)**

Unless otherwise stated, all items were measured at the first contact when the cohort child was aged around 34 months. N is the unweighted base. The percentages represent the weighted figures. Figures in bold represent $p<0.05$.

who had inconsistently abnormal scores. Compared with children who did not have abnormal conduct problem scores at any time, children with any abnormal conduct scores were more likely in an adjusted model to have a younger mother, not to be living with both parents, to have another child in the household, to be in poor general health, to have difficulty being understood and to be rarely taken to visit other people with children. Conduct problems were also more likely to be reported by mothers who smoked during pregnancy and by parents who agree that smacking is sometimes necessary. These associations are broadly in line with findings from other cohort studies, which have reported predictors of conduct problems[9 10] and larger cross-sectional studies of psychiatric disorder among children.[20]

The implications of our findings nevertheless must be considered in relation to the design of the study. GUS data are obtained from the child's main carer, usually the child's natural mother and are therefore a measure of the parent's perception of the child's behaviour and interactions. Previous reports on the diagnostic validity of the SDQ[21–23] indicate that combinations of parent and teacher information provide the most robust data with the greatest sensitivity. On the basis of this validation work, we would anticipate some relative under-reporting of

conduct difficulties by parents. Nevertheless, 27% of children had an abnormal score on the conduct scale of the SDQ at one or more collection points and 4.3% at all sampling times. Since life-course-persistent CD is characterised by early onset and persistence, we consider it likely that there will be considerable overlap between children with persistently abnormal scores on the conduct subscale of the SDQ and those with this diagnosis. It is important to bear in mind, however, that no diagnostic assessment has been undertaken on these children and further follow-up will be necessary to establish a diagnosis. Furthermore, there may be some children who will go on to have a diagnosis of CD who did not have abnormal scores reported at all three time points reported here. The longitudinal stability of CD (and antisocial behaviour more broadly) is an important consideration in interpretation of our results. Significant fluctuations in conduct problems in preadolescence have been reported by a number of authors,[24–26] and there are similar indications from our own data. Nevertheless, persistence of conduct problems in early childhood is a good early indicator for life-course-persistent CD, particularly for boys.[24 26]

A relationship between maternal smoking during pregnancy and antisocial behaviour has been described by several authors. At least part of the relationship may, however, be explained by confounding factors not examined in the present study. For example, in the e-risk cohort study, Maughan and colleagues[27] found that around half of the association was attributable to genetic confounders. Mothers in that cohort who smoked during pregnancy were more likely themselves to have had antisocial behaviour and to have had children with more antisocial men. They were also living in more disadvantaged circumstances and were more likely to have had depression. Controlling for antisocial behaviour in both parents, depression in mothers, family disadvantage and genetic influences, estimates for the effects of prenatal smoking were reduced by between 75% and the entire initial effects. Nevertheless, regardless of causality, maternal smoking during pregnancy does appear to be a useful predictor of persistently reported child conduct problems. Similar considerations may apply to the relationship with parental separation and low household income described in the present study.

There were some notable differences between the characteristics of the inconsistent and persistent conduct problem groups. Low household income and maternal smoking during pregnancy were associated with persistent conduct problems substantially more strongly than with inconsistent conduct problems. There was also a strong negative interaction between poverty and smoking: among women who smoked during pregnancy those with low incomes were no more likely to have children with persistent conduct problems than those from higher-income families. This was not the case for children with inconsistent conduct problems. It is possible that this non-additive effect of poverty and smoking on persistent conduct problems reflects a view of smoking as more socially deviant in families living in more affluent circumstances. This in turn may be a consequence of some of the genetic factors postulated by Maughan, which are more likely to be salient in persistent conduct problems than in inconsistent problems.[28] It is possible that there may be discrete genetic influences linking conduct problems with poverty (mediated, eg, through communication disorders[29]) and with smoking.[30]

Although male sex was not significantly associated with persistent conduct problems in our model, there was a male preponderance (59% male in the persistent group and 54% in the inconsistent group). This corresponds reasonably closely with reports from cross-sectional studies of psychiatric disorder—for example, 69% of all cases of CD were male in the 2004 survey of mental health in the UK.[20]

What is already known on this subject

- Life-course-persistent CD is a major public health problem, and a screening programme could be justifiable.
- Scoring systems for prediction of persistent conduct problems may help to identify children who may benefit from behavioural interventions.
- Some previous studies have identified a range of candidate physical and social predictors for CD.

What this study adds

- In a Scottish cohort study, several predictive factors were associated with conduct problems at age 3, 4 and 5 years.
- Compared with children with no conduct problems, children with reported problems were significantly more likely to have mothers who smoked during pregnancy. They were less likely to be living with both parents and more likely to be in poor general health, to have difficulty being understood, to have a parent who agrees that smacking is sometimes necessary and to be taken to visit other people with children rarely.
- Persistent and inconsistent conduct problems had similar risk factors, but associations with poverty and maternal smoking were significantly stronger in the persistent group.

Children with identifiable health problems at age 3 are at an increased risk of conduct problems. Delays in language development at the same age were also associated with conduct problems, compatible with previous findings of a strong relationship between language delay and psychopathology[31] and school exclusion,[32] in part related to peer rejection.[33]

Early parenting style was also related to persistent conduct problems. Belief in the efficacy of harsh discipline—smacking—at age 3 was, as expected,[34 35] associated with conduct problems. Low frequencies of visits to other households with children were strongly associated with persistent and inconsistent conduct problems, but these family behaviour patterns may be responses to already difficult behaviour rather than precursors of it.

With longer follow-up, our model could potentially be used to derive a scoring system, which could allow health professionals to predict persistent CD during preventive child health contacts. Families of children identified in this way could be offered evidence-based parenting interventions,[7 36] which would in turn need to be evaluated rigorously when used in this context.

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Contributors All authors contributed to the conception and design of the study. PW drafted the article, and PB and ST performed the statistical analyses with guidance from PW, HM, MH and GD who, along with PB, contributed to the interpretation of the data. All authors approved the manuscript, and PW is the guarantor of the paper.

Competing interests None.

Ethics approval Ethics approval was provided by the Scotland 'A' MREC committee (application reference: 04/M RE 1 0/59).

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Data sharing statement All the data presented here are now available to those members of the public who are able to obtain an ATHENS password.

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Correction

Wilson P, Bradshaw P, Tipping S, *et al*. What predicts persistent early conduct problems? Evidence from the Growing Up in Scotland cohort. *J Epidemiol Community Health* 2013;67:76-80. The ages in the introduction, methods, results section and table 1 have been corrected from 34, 46 and 58 months to 46, 58 and 70 months. Also the statical methods section and the footnote in table 2 have been corrected from 34 months to 46 months.

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