

Respiratory illness in children: what makes parents decide to consult?

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SUMMARY. Parents of a stratified random sample of 234 children from 21 training practices in north east England were interviewed at home. All these children had been reported in a postal questionnaire as having had a cough between six and 10 weeks before the interview. Interviews covered social characteristics of the family, the severity of the child's cough and the child's previous respiratory history. These data were analysed using the statistical technique of logistic regression.

This produced a good model of consulting behaviour. The model showed that a doctor was likely to be consulted if the child had severe symptoms, or if the cough affected the child's behaviour. This suggests that most parents deciding whether to consult the doctor make careful decisions based on what they see as objective criteria. No social characteristic had a significant influence on the decision to consult the doctor over and above the influence of the characteristics and effect of the cough itself.

Introduction

IN the 1981–82 national morbidity study,¹ 30% of all consultations for children aged less than 11 years were for respiratory disease. Many episodes of acute respiratory illness are self-limiting, so that the doctor can contribute little to recovery.² Many similar episodes are dealt with in the home.^{3–6} This leads to a widespread professional belief that patients who consult with self-limiting conditions do so unnecessarily, inappropriately or for trivial reasons.^{2,4,7–10}

Despite this belief, there has been little research into how parents come to the decision to consult a doctor for their children's illness. This research has been limited to one small geographical area,⁵ one general practice,^{6,11–13} or one socio-economic group.^{14,15} Because these studies focussed neither on specific childhood conditions nor on a single episode of illness, they produced very general accounts of parental behaviour in response to their children's illness.

In this study factors that influenced the decision to consult a doctor for a single episode of a single symptomatic condition were investigated, allowing the severity of the condition to be taken into account. This was important because research into adults' own consulting behaviour has suggested that the perceived severity of an illness explains most of the variation in consultation rates.^{16,17} The study was conducted in a larger number of general practices, covering a wider geographical area, than previous studies. This was possible because the study was link-

ed to the north of England study of standards and performance in general practice — a major study of standard setting in general practice, based in 65 training practices.¹⁸

Method

Data were collected from the parents of children registered with 21 training practices in north east England. These practices ranged from very small to very large, and from rural to inner city.

As part of the north of England study, a postal questionnaire was sent to the parents of every child registered in these practices six weeks before interviewing was due to take place. It asked about the prevalence of, and consultations for, five symptomatic conditions of childhood, including acute cough and recurrent wheezy chest. Ninety one per cent of parents responded.

From the replies to this questionnaire a random sample of 249 children was drawn, stratified by practice. Every child sampled had been reported as having had a cough in the four weeks before receiving the postal questionnaire, and half of these children had been taken to the doctor with the cough. To ensure a wide range of respiratory morbidity in the sample, proportionately more children who had been reported as having recurrent wheezy chest were sampled. Twenty three of these children could not be contacted and were replaced by similar children.

The parents of 234 (94%) of the 249 children were interviewed at home using a structured schedule covering: social characteristics of the family; the cough itself, with questions designed to obtain the sort of information available to a general practitioner through history-taking; and the child's previous respiratory history.

The resulting data were reweighted before analysis to compensate for the disproportionate sampling scheme. The chi-squared test was used to examine how each of the individual factors were associated with parents' decisions to consult a doctor for their child's cough. To identify the group of factors that best explained the decision to consult, the statistical technique of logistic regression was used.^{19,20} Rao and Scott²¹ have shown that chi-squared tests of data derived from complex sample surveys, and appropriately reweighted, are more or less unbiased; and Roberts and colleagues²² have shown that logistic regression analysis of such data also yields acceptable significance tests.

The regression equation was derived step by step from those factors significantly associated with the decision to consult. At each step the factor that best improved the mathematical model for explaining parents' decisions was added (in statistical terms, the factor that generated the greatest increase in maximum log likelihood). This process stopped when no other factor could increase this maximum log likelihood by the amount that would be significant at the 0.1% level; this stringent significant level was chosen to ameliorate the problem of 'multiple comparisons'²³ resulting from the very large number of significance tests inherent in the step-by-step nature of the analysis.

Results

Influence of individual factors

Social factors. Table 1 shows a selection of the 40 social factors studied, tabulated against the parents' decision whether to con-

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Table 1. Association between selected social factors and the decision to consult.

| | Total number who replied: | | Percentage of those replying 'yes' who consulted | Percentage of those replying 'no' who consulted | Relative risk of consulting (95% confidence intervals ²⁴) |
|---|---------------------------|------|--|---|---|
| | 'yes' | 'no' | | | |
| Child less than 1 year? | 33 | 201 | 79 | 36 | 6.7*** (3.0, 15.0) |
| Father not employed? | 49 | 185 | 67 | 36 | 3.6*** (1.9, 6.8) |
| Family has no car? | 65 | 169 | 65 | 34 | 3.6*** (2.0, 6.5) |
| Accommodation rented? | 71 | 163 | 61 | 34 | 3.1*** (1.7, 5.6) |
| Mother not employed? | 142 | 92 | 52 | 28 | 2.8*** (1.6, 5.0) |
| Smoker in household? | 114 | 120 | 52 | 34 | 2.1** (1.2, 3.5) |
| Mother left full-time education before 16 years | 153 | 81 | 47 | 33 | 1.8* (1.0, 3.1) |
| Family has 3 or more children | 47 | 187 | 48 | 41 | 1.3 (0.7, 2.5) |

* $P<0.05$; ** $P<0.01$; *** $P<0.001$.

sult for the child's cough. In general, parents of children in more deprived circumstances were significantly more likely to consult the doctor for their child's cough.

Cough characteristics. Table 2 shows a selection of the 51 characteristics of the child's condition investigated by the parental interviews, again tabulated against the parents' decision. All those relating to the perceived severity of the cough were highly associated with the decision to consult.

Respiratory history. Of the 12 aspects of the child's respiratory history studied only a previous history of recurrent wheezy chest, recorded in response to the preceding postal questionnaire, was significantly associated with the decision to consult ($P<0.001$); of the 53 children whose parents reported recurrent wheezy chest, 36 (68%) consulted, while only 63 (35%) of the remaining 181 did so.

Simultaneous influence of many factors

The purpose of the regression analysis was to derive a succinct but powerful mathematical model of the reasons for parents' decisions. Of the total of 103 factors available to explain these decisions the question whether the child had difficulty in breathing was statistically the most effective. It was therefore selected as the first factor in the regression equation. Although 'difficulty breathing' generated only the third highest relative risk of consulting (Tables 1 and 2) the lower limit of the corresponding confidence interval was higher than any other lower limit.

The next three factors to enter the regression equation also describe the cough or its effect upon the child. A doctor was more likely to be consulted if the child needed more attention than usual; if the child had pain when coughing; or if the child

slept more during the day (Table 2). After these, none of the remaining 97 factors could significantly improve the statistical performance of the regression equation in explaining parents' decisions. Figure 1 displays z-scores for each of the 234 children, calculated from the final regression equation listed in Appendix 1.

Appendix 1 also shows how each of these z-scores can be used to estimate the parents' prior probability of consultation. The higher the z-score, the higher the estimated prior probability of consulting; the lower the z-score, the lower the prior probability of consulting. The children at the right-hand end of the distribution had a z-score of 3.5 and a 97% prior probability of consultation; the children at the left-hand end of the distribution had a z-score of -2.5 and an 80% prior probability of consultation.

A notable feature of Figure 1 is the consistency between these estimated prior probabilities and the proportion of parents who actually did consult. Only five parents whose child had a z-score of more than two (and thus a prior probability of consulting of at least 88%) did not do so; and only eight parents whose children had a z-score of less than minus two (and thus a prior probability of at most 12%) did consult. (When we compensated for the disproportionate sampling scheme, the five non-consulting parents at the right-hand end of Figure 1 were reduced to the equivalent of 2.2 parents out of 234, and the eight consulting parents at the left-hand end were reduced to the equivalent of 6.5 parents out of 234.) These interview schedules were examined for written information that had not been subjected to statistical analysis. For four of the five children who did not consult despite a high prior probability, the child's parents had experience of dealing with similar coughs in that child or in a sibling; they knew what to do and how to cope. The fifth was the child of a general practitioner and a nurse.

Table 2. Association between selected 'cough' characteristics and the decision to consult.

| | Total number who replied: | | Percentage of those replying 'yes' who consulted | Percentage of those replying 'no' who consulted | Relative risk of consulting (95% confidence intervals ²⁴) |
|--|---------------------------|------|--|---|---|
| | 'yes' | 'no' | | | |
| Child distressed? | 24 | 210 | 86 | 37 | 10.4*** (4.1, 26.5) |
| Child needed more attention? | 142 | 92 | 60 | 16 | 7.9*** (4.2, 14.7) |
| Child had difficulty breathing? | 77 | 157 | 74 | 27 | 7.7*** (4.3, 13.6) |
| Child had pain when coughing? | 50 | 184 | 78 | 33 | 7.2*** (3.7, 14.1) |
| Parent could hear sounds on child's chest? | 84 | 150 | 71 | 26 | 7.0*** (2.6, 18.5) |
| Child slept more during day? | 52 | 182 | 74 | 33 | 5.8*** (3.0, 10.9) |
| Child unwell with cough? | 42 | 192 | 72 | 36 | 4.6*** (2.2, 9.4) |
| Child off food? | 112 | 122 | 58 | 28 | 3.5*** (2.1, 5.9) |

*** $P<0.001$.

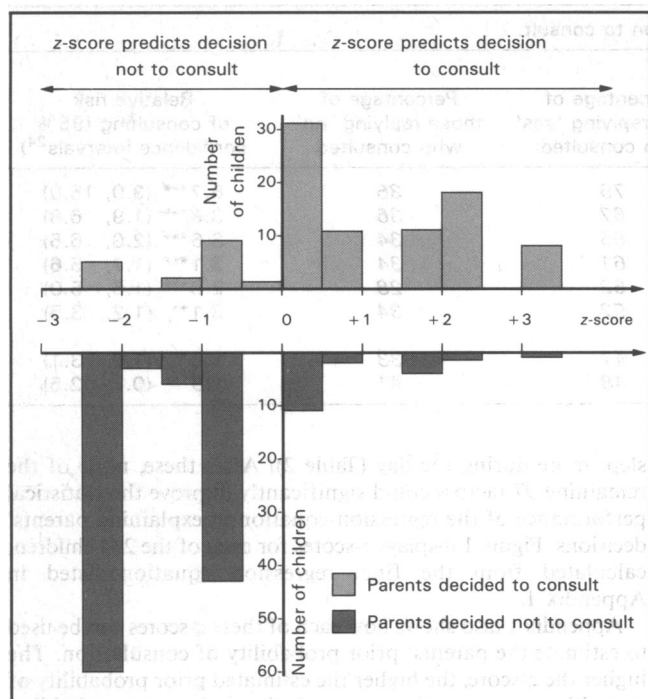


Figure 1. Logistic regression: distribution of resulting z-scores (see Appendix 1).

Reasons for consulting a doctor despite a low prior probability were more mixed; for example, a doctor was called out for a baby brother and asked to look at the child with the cough while he was there; and a mother needed reassurance because her elder child had a severe chronic illness, she herself suffered from depression and her husband worked long hours. Thus, almost all these apparently inconsistent decisions had a rational basis.

Table 3 summarizes the effectiveness of the regression equation and shows that it correctly identified 82% of 234 decisions whether to consult. If this equation had been no better than random, it would have correctly identified only 50% of decisions.

Table 3. Logistic regression: accuracy of resulting predictions.

| Prior probability of consulting | Number (%) of parents | | |
|---------------------------------|-----------------------|-----------------|-------|
| | Consulted | Did not consult | Total |
| >50% | 80 (78) | 22 (22) | 102 |
| ≤50% | 19 (14) | 113 (86) | 132 |
| Total | 99 | 135 | 234 |

Discussion

Until now, no study of adults' or childrens' consulting behaviour has focussed on a specific condition and taken the perceived severity of that condition into account. In this study the factors that influence parents' decisions to consult a doctor for a single episode of a single symptomatic condition — acute cough — in one of their children were investigated. The analysis of data from 234 interviews covering 21 widely differing training practices has generated a mathematical model of parents' consulting behaviour for their child's cough. This shows that a doctor is likely to be consulted if the child is thought to have severe symptoms — difficulty in breathing or pain on coughing; or if the cough is perceived to have affected the child's behaviour

— so that she or he needed more attention than usual, or slept more during the day.

It has been established that this model is sound in three senses. First, it correctly identified 82% of parents' decisions whether to consult. Secondly, the lower the prior probability of consultation as estimated by the model, the smaller the empirical proportion of parents who actually consulted. Finally, on almost all of the 13 occasions when parents' behaviour differed markedly from the behaviour to be expected from the model, satisfactory explanations were found in the specific circumstances of the decision to consult.

However, to validate a model in this way has one disadvantage: the same data have been used both to derive the model and to test it. The most rigorous test of such a model is whether it can accurately predict parents' decisions in future, for example in a second set of data, collected prospectively. Unfortunately, this test would have been both time-consuming and expensive. A prospective data set was therefore simulated by dividing up the existing data set practice by practice. This rigorous but inexpensive ploy shows that models derived from 20 of the 21 practices can on average predict 70% of parents' decisions in the remaining practice (Wyke S, PhD thesis, University of Newcastle upon Tyne, 1987). This confirms that the basic model is both valid and reliable.

Although the statistical technique used has proved effective in identifying parents who consult, it is less effective in identifying the true determinants of their decisions. If a true determinant were highly correlated with some other factor, the step by step nature of the analysis could easily pick the wrong factor for the model. It is a matter of chance which of two highly correlated factors enters the model.

Of the four specific factors in this model, two describe symptoms apparently associated with the cough, and the other two document the perceived effect of the cough on the child's behaviour. But because of their high correlation with other perceived cough characteristics, it cannot be said that these four factors are the fundamental determinants of decisions to consult for the children's coughs. However, it can be said that taken together the characteristics of the child's cough strongly influence parents' decisions. But because there are so many of these characteristics competing to enter the model, it is a matter of chance which are selected and which are not.

Nevertheless, this study has provided unequivocal evidence that these perceived cough characteristics are more powerful influences on the decision to consult than the child's social characteristics. Despite strong associations between consultation decisions and individual factors describing material deprivation, none of these factors, or any other social factor, came at all close to entering the model. This suggests that their influence on consulting was through association with the severity of the cough and its effect upon the child. This finding, which implies that coughs were worst among the more materially deprived children in the sample, requires further investigation.

Previous research^{12,13} had suggested that a mother's educational level and the number of children in the family under 12 years of age were important in explaining differences in consultation rates between families. Neither of these factors influenced the decision to consult within the sample in this study. The explanation for this may lie in the different designs of the two studies: our research concentrated on the decision to consult for a single episode of respiratory illness and collected data on the severity of the illness; in contrast the previous study^{12,13} calculated consultation rates for families over a year, and could not measure the severity of each illness. Once information about the perceived severity of an episode is available, it can be seen as the major influence on the decision to consult.

In summary, this study shows that parents' decisions to consult a general practitioner for their children's coughs are heavily based on their perceptions of the severity of that cough; other considerations seem to play little part. The interview schedule was designed to obtain information on perceived severity and cough characteristics similar to that available to a general practitioner through history-taking. Thus, this study suggests that most parents take considerable care in deciding whether to consult a general practitioner for their child's respiratory illness. They base these decisions on what they see as objective criteria, such as the presence of symptoms that they perceive as severe, and the effects of the cough upon the child. The illness may be self-limiting, the doctor may even view the consultation as inappropriate,^{2,4,7-10} but the parents do not take lightly the decision to consult; from their perspective this decision is far from trivial. Most parents also understand the doctor's perspective;¹¹ in particular they discuss consulting in terms of 'bothering the doctor' and are reluctant to 'waste the doctor's time'.

If more doctors were committed to understanding the process by which parents decide to consult, the partnership between parents and practitioners could be more fruitful. Parents are skilled in recognizing changes in the behaviour of their children, while practitioners are skilled in diagnosing those changes and formulating an appropriate management plan. These skills are complementary and, if recognized as such, could enhance primary health care for children.

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Appendix 1

- Final regression equation (from which z-scores are calculated):

$$z = 1.82 + 1.41 \text{ (if child had difficulty breathing)} \\ + 1.54 \text{ (if child needed more attention)} \\ + 1.71 \text{ (if child had pain when coughing)} \\ + 0.66 \text{ (if child slept more during day)}$$

- Once z has been calculated from this equation:

$$\text{Probability that parent would consult} = e^z / (1 + e^z) \\ \text{Probability that parent would not consult} = 1 / (1 + e^z)$$

- This equation represents a good fit to the data since the lower the calculated prior probability of consultation, the lower the empirical proportion of patients who actually consulted; and the 'residual deviance' (a statistical measure of the variation in parents' decisions that the equation cannot explain¹²) of 208.3 is less than the 'norm' of 229, equal to the number of 'residual degrees of freedom'.

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