they often face hostile attitudes of staff and members of the public.¹² These factors prevent them from taking part in activities as a whole family.

Parents frequently report the need for a break from caring. Such a break can provide time for themselves and their partners, and time to spend with their other children. Services that provide short term breaks can reduce mothers' stress, but many families have problems obtaining appropriate services.¹³ Children for whom provision is most inadequate include those with complex health needs or with challenging behaviour or autistic spectrum disorders and children from minority ethnic families.

How can primary care trusts respond to these issues? Studies of key worker services have consistently shown positive effects on unmet needs and family well-being.¹⁴ Key workers are part of the solution to ensuring a more holistic assessment of families' social and economic needs. However, key workers cannot provide access to resources that do not exist in their local area. Thus primary care trusts can have several roles. They can ensure that workers are aware of the needs of disabled children and their families. They can make sure that families are offered a key worker, that families' needs are assessed (by asking questions about the child's sleep patterns, housing problems, and parents' levels of stress, for example), and that appropriate interventions are available in their local area.

Primary care trusts can also promote strong multiagency working and commissioning of services for disabled children. They can also ensure that the needs of disabled children and their families are central to the agendas of children's trusts and that

housing and leisure agencies are included in plans to meet these needs.

Tricia Sloper *assistant director* (ps26@york.ac.uk)

Bryony Beresford *senior research fellow*

Social Policy Research Unit, University of York, York YO10 5DD

Competing interests: None declared.

- 1 Gordon D, Parker R, Loughran F, Heslop P. *Disabled children in Britain: a re-analysis of the OPCS disability surveys*. London: Stationery Office, 2000.
- 2 Dobson B, Middleton S. *Paying to care: the costs of childhood disability*. York: Joseph Rowntree Foundation, 1998.
- 3 Beresford B. *Expert opinions: a national survey of parents caring for a severely disabled child*. Bristol: Policy Press, 1995.
- 4 Roberts K, Lawton D. *Reaching its target? Disability living allowance for children*. York: Social Policy Research Unit, University of York, 1998. (Social policy reports No 9.)
- 5 Chamba R, Ahmad W, Hirst M, Lawton D, Beresford B. *On the edge: minority ethnic families caring for a severely disabled child*. Bristol: Policy Press, 1999.
- 6 Wallander JL, Varni JW. Effects of pediatric chronic physical disorders on child and family adjustment. *J Child Psychol Psychiatry* 1998;39:29-46.
- 7 Beresford B, Sloper P, Baldwin S, Newman T. *What works in services for families with a disabled child?* London: Barnardos, 1996.
- 8 Lancioni GE, O'Reilly ME, Basili G. Review of strategies for treating sleep problems in persons with severe or profound mental retardation or multiple handicaps. *Am J Ment Retard* 1999;104:170-86.
- 9 Feldman M, Werner S. Collateral effects of behavioral parent training on families of children with developmental disabilities and behavior disorders. *Behav Interventions* 2002;17:75-83.
- 10 Beresford B, Oldman C. *Housing matters: national evidence relating to disabled children and their housing*. Bristol: Policy Press, 2002.
- 11 Beresford B, Williams J, Lawton D. *Community equipment: use and needs of disabled children and their families*. York: Social Policy Research Unit, University of York, 2002.
- 12 Finch N, Lawton D, Williams J, Sloper P. *Disability survey 2000: young people with a disability and sport*. London: Sport England, 2001.
- 13 Chan JB, Sigafos J. Does respite care reduce parental stress in families with developmentally disabled children? *Child Youth Care Forum* 2001;30:253-63.
- 14 Liabo K, Newman T, Stephens J, Lowe K. *A review of key worker systems for disabled children and the development of information guides for parents, children and professionals*. Cardiff: Wales Office of Research and Development for Health and Social Care, 2001.

doi 10.1136/bmj.39017.633310.BE

Breast feeding and intelligence in children

Mediated by mother's intelligence rather than better nutrition

Research p 945

Many studies report that children who were breast fed perform better in tests of intellectual competence than those who were not.¹⁻³ This association is seen for full term infants and more strongly for those who are preterm or of low birth weight. The IQ advantage for full term infants is small, roughly three to four points, but it is remarkably consistent across studies. It is unclear, however, whether this difference reflects a direct nutritional advantage or a difference in socioenvironmental factors that are more favourable in women who breast feed.

Women who breast feed are more likely to provide their child with a more enriched and cognitively stimulating environment than those who do not breast feed, which could contribute to their children's better cognitive performance. Several studies have reported a positive relation between mother's IQ and the decision to breast feed.¹ A study in this week's *BMJ* by Der and colleagues assesses the impact of controlling for maternal intelligence and other confounding factors on this association.¹

To distinguish between the contributions of nutrition and socioeconomic factors to childhood IQ, previous studies have used socioeconomic status and maternal education to measure the quality of the child rearing environment.² Studies that show a positive effect of breast feeding on childhood IQ after controlling for socioeconomic status and mother's education conclude that breast feeding has a benefit above and beyond that of a better child rearing environment. In our cohort of 323 children from Michigan, we confirmed previous findings of a positive association between breast feeding and higher childhood IQ after adjustment for socioeconomic status and mother's education.⁴ However, when we also controlled for more direct indicators of parental cognitive stimulation—maternal vocabulary IQ and the home observation for measurement of the environment scale (HOME)—the association between breast feeding and childhood IQ was no longer evident. HOME is a semistructured interview and behavioural observation measure that assesses the quality of intellectual stimulation and emotional support provided by parents. Despite these

BMJ 2006;333:929-30

findings, many recent studies that have considered socioenvironmental factors have underplayed the role of maternal IQ in the association between breast feeding and cognitive function.

Der and colleagues' new study demonstrates the importance of controlling for maternal IQ by showing that the association of breast feeding with cognitive performance in children drops from 4.7 to 0.5 points after adjusting for mother's cognitive competence and other socioenvironmental measures in a large cohort of 5475 children from the national longitudinal survey of youth.¹ Moreover, the study identifies maternal IQ as the main variable that accounts for the association between breast feeding and childhood IQ. Of the nine indicators included in their regression analysis, maternal IQ was the strongest predictor. The authors suggest that the association between breast feeding and childhood IQ results from the relation between cognitive competence in mother and child—attributable at least in part to heritability—and the fact that mothers with a higher IQ are more likely to breast feed.

The strength of the association between the outcome and a given predictor in multiple regression analysis depends, in part, on the reliability with which that predictor is measured. The short form of HOME was administered in the national longitudinal survey of youth, and Der and colleagues included only two of the subscales in their analysis. We used the complete HOME assessment in our research, and maternal vocabulary IQ and HOME contributed equally to the prediction of IQ score at 11 years of age.⁵ These data suggest that heritability and rearing environment play an equally important part in the association between breast feeding and childhood IQ, and that these factors should be considered in evaluating the impact of breast feeding on cognitive ability in children. In contrast to IQ and quality of child rearing, maternal depression, anxiety, and stressful events were not related to duration of exclusive breast feeding.⁵⁻⁶ These data support Der and colleagues' finding that maternal intellectual enrichment and genetic endowment, as measured by maternal IQ, are crucial potential confounders of the effect of breast feeding on cognitive competence in children.

The US Department of Health and Human Services Office on Women's Health concluded that

"the observation ... that ... cognitive function of [breast-fed] children is greater than in non-breastfed children ... has not been conclusively proven."⁷ The inconsistency in the literature is due, at least in part, to the use of global indirect indicators of the social environment. Der and colleagues' meta-analysis shows that, when the relevant confounding variables are included, the data do not support a direct nutritional benefit for childhood IQ in full term infants.

Other benefits of breast feeding—such as the effect of colostrum on the immune system, emotional benefits that may promote more secure infant-mother attachment, and the effects of omega 3 fatty acids on cognitive and visual development in preterm and low birthweight infants—are well established. But Der and colleagues' results may help doctors when giving advice on breast feeding to mothers with particular problems—for example, women who take drugs to prevent seizures or depression—which may affect the infant when transferred via breast milk—or women who want or need to go back to work. These data indicate that one consideration—an adverse long term effect on cognitive function—need not be of concern.

Sandra W Jacobson *professor*

(Sandra.Jacobson@wayne.edu)

Joseph L Jacobson *professor*

Department of Psychiatry and Behavioral Neurosciences, Wayne State University, School of Medicine, Detroit, Michigan 48207, USA

Competing interests: None declared.

- 1 Der G, Batty GD, Deary IJ. Effect of breast feeding on intelligence in children: prospective study, sibling pairs analysis, and meta-analysis. *BMJ* 2010;340:b0001.
- 2 Lucas A, Morley R, Cole TJ, Lister G, Lesson-Payne C. Breast milk and subsequent intelligence quotient in children born preterm. *Lancet* 1992;339:261-4.
- 3 Anderson JW, Johnstone BM, Remley DT. Breast-feeding and cognitive development: a meta-analysis. *Am J Clin Nutr* 1999;70:525-35.
- 4 Jacobson SW, Jacobson J. Breastfeeding and intelligence. *Lancet* 1992;339:926.
- 5 Jacobson SW, Chiodo LM, Jacobson JL. Breastfeeding effects on intelligence quotient in 4- and 11-year-old children. *Pediatrics* 1999;103:e71.
- 6 Rao MR, Hediger ML, Levine RJ, Naficy AB, Vik T. Effect of breast-feeding on cognitive development of small for gestational age infants. *Acta Paediatr* 2002;91:267-74.
- 7 US Department of Health and Human Services, Office on Women's Health. *Health and human services blueprint for action on breastfeeding*. Washington, DC: US DHHS, 2000.

doi 10.1136/bmj.39020.473322.80

Pulmonary artery catheters

As currently used, do not benefit patients

The description of the flow directed pulmonary artery catheter in 1970 and its subsequent commercial development allowed clinicians to measure cardiac output and derive central haemodynamic parameters at the bedside.¹ On the assumption that measuring and manipulating these variables would improve outcomes, this device became widely used in intensive care units. Very soon reports of serious complications including potentially fatal pulmonary artery rupture appeared,² and arguments for and

against its use have continued ever since. A recent addition to the debate is a comprehensive evaluation of both the clinical and cost effectiveness of such catheters in adult intensive care units in the United Kingdom.³ The research was commissioned by the UK's National Health Service Health Technology Assessment (HTA) programme; the authors were from the Intensive Care National Audit and Research Centre, practising intensive care clinicians, and academics. Given 35 years of research and debate,

BMJ 2006;333:930-1