

COLLECTION  
Health and  
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May 2000

## Foreword

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Similar to what has been observed in the majority of industrialized nations over the past twenty years, Québec and Canada have seen a significant increase in the costs related to maladjustment, particularly in young people. The Longitudinal Study of Child Development in Québec (*l'Étude longitudinale du développement des enfants du Québec*) (ÉLDEQ 1998-2002) being conducted by *Santé Québec* (Health Québec),<sup>1</sup> a division of *l'Institut de la statistique du Québec (ISQ)*<sup>2</sup> (Québec Institute of Statistics) in collaboration with a group of university researchers, will provide an indispensable tool for action and prevention on the part of government, professionals and practitioners in the field, who every day must face maladjustment in children.

More precisely, a major purpose of this longitudinal study of a cohort of newborns is to give Québec a means of preventing extremely costly human and social problems, such as school dropout, delinquency, suicide, drug addiction, domestic violence, etc. Similar to what is being done elsewhere (in the UK, New Zealand, the US), *Santé Québec* and a group of researchers have designed and developed a longitudinal study of children 0 to 5 years of age (2,223 children in this study and 600 twins in a related one). It will help gain a better understanding of the factors influencing child development and psychosocial adjustment.

The general goal of ÉLDEQ 1998-2002 is to learn the PRECURSORS, PATHS and EFFECTS, over the medium and long terms, of children's adjustment to school. ÉLDEQ is the logical extension of the National Longitudinal Study of Children and Youth (NLSCY, Canada). These Québec and Canada-wide longitudinal studies are both comparable and complementary. They employ distinct survey methods, and use different techniques to obtain the initial samples. Though many of the instruments are practically

identical, about a third of those being used in ÉLDEQ are not the same.

This first report casts light on the enormous potential of the data generated by this study. From the descriptive analyses of the results of the first year of the study to the longitudinal analyses of subsequent years, there will be an enormous wealth of data. With updated knowledge on the development of the cohort of young children, the annual longitudinal follow-up will respond to the needs which the *ministère de la Santé et des Services Sociaux du Québec - MSSS* (Ministry of Health and Social Services), who financed the data collection, expressed in both the Report of the Working Group on Youth (*Rapport Bouchard, 1991, Un Québec fou de ses enfants* - the Bouchard Report, 1991, A Québec in Love with its Children) and the policy papers entitled *Politique de la santé et du bien-être, 1992* (Health and Well-Being) and *les Priorités nationales de santé publique 1997-2002* (Public Health Priorities 1997-2002).

Director General

Yvon Fortin

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1. Certain French appellations in italics in the text do not have official English translations. The first time one of these appears, the unofficial English translation is shown immediately after it. Following this, for ease in reading, only the official French name appears in the text in italics, and it is suggested the reader refer to the Glossary for the English translation.
  2. *Santé Québec* officially became a division of the *ISQ* on April 1, 1999.



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This analytical paper is also available in French. [Ce numéro est aussi disponible en version française sous le titre : « Le tempérament » dans *Étude longitudinale du développement des enfants du Québec (ÉLDEQ 1998-2002)*, Québec, Institut de la statistique du Québec, vol. 1, n° 7.]

**Caution:**

Unless indicated otherwise, "n" in the tables represents data weighted to the size of the initial sample.

Because the data were rounded off, totals do not necessarily correspond to the sum of the parts.

Unless explicitly stated otherwise, all the differences presented in this report are statistically significant to a confidence level of 95%.

To facilitate readability, proportions higher than 5% were rounded off to the nearest whole unit in the text, and to the nearest decimal in the tables and figures.

As expected, certain data characterizing various phenomena in the study did not follow a normal distribution. This non-normality, indeed the asymmetry of certain variables measuring child development or the infants family environment, makes it difficult to interpret the results of certain parametric tests (Student's *t* test, Fisher test - ANOVA). In spite of this, the authors, similar to their peers working on longitudinal studies, have calculated and presented associations using estimators such as means, linear regressions and correlations. For these data, caution is recommended when interpreting the results. In annual longitudinal monitoring, trends are important and not each cross-sectional measurement taken in isolation.

**Symbols**

... Not applicable (N/A)  
.. Data not available  
-- Nil or zero  
p < Refers to the threshold of significance

**Abbreviations**

CV	Coefficient of variation
Not avail.	Not available
not signif.	Not significant

## Acknowledgments

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*Santé Québec* recognizes that the development and implementation of the Longitudinal Study of Child Development in Québec (ÉLDEQ 1998-2002) flows directly from the synergy of effort and professionalism of many people throughout the whole process of mounting a survey of this size. Since 1995, individuals, various groups and organizations, a survey firm and the staff of *Santé Québec* have become indispensable links in making this ambitious project a reality - the first annual longitudinal survey of Québec infants.

A major characteristic of this project is that a pretest and survey are conducted every year. To accomplish this, we must annually: 1) make two sets of instruments (pretest and survey), 2) conduct two data collections, 3) analyze two sets of data, and 4) produce two types of communications materials. The results of each pretest means fine-tuning and developing instruments for the survey, which follows 17 months later. The results are sent to the parents (highlights), published in reports, and communicated to the scientific community and the public at large. The professionals and staff involved in collecting the data, as well as those involved before and after, must put their nose to the grindstone every year. We cannot over-emphasize our profound recognition of the incredible, concerted effort they are putting into this project over an 8-YEAR period, from the first pretest in 1996 to the final report to be published in 2004!

First, it must be said that without Daniel Tremblay, Director of *Santé Québec* (now part of the *ISQ*) since 1994, Christine Colin, Assistant Deputy Minister responsible for Public Health 1993-1998, Aline Émond, Director of *Santé Québec* 1986-1993, Richard E. Tremblay, Director of the ÉLDEQ research project, and Marc Renaud, President of *le Conseil québécois de la recherche sociale - CQRS* 1991-1997. ÉLDEQ 1998-2002, also known as "In 2002...I'll Be 5 Years Old!," would have never seen the light of day. In turn and together, they developed, defended and obtained the financing for this study. Thank you for your indefatigable tenacity.

A warm thanks to all the researchers and the support staff of their respective research groups, whose determination over the years has never wavered. Putting their research grants together every

year has contributed to the development of the instruments, analysis of the data and publication of the copious results.

I would like to thank Lyne Des Grosseilliers, ÉLDEQ's statistician since 1996, Robert Courtemanche, statistical advisor, and France Lapointe, ÉLDEQ's statistician 1995-1996. These three colleagues in the *Direction de la méthodologie et des enquêtes spéciales* (Methodology and Special Surveys Division) (*ISQ*) managed, with great skill, to set the signposts and navigate the somewhat winding course of this large-scale survey first.

A very special thanks to all the master designers of the National Longitudinal Study of Children and Youth (NLSCY, Canada). Without their expertise, advice and generosity, our survey would never have been accomplished. In many senses of the word "modeling," ÉLDEQ has learnt a lot from the NLSCY.

We would also like to extend our gratitude to the staff of the *Groupe de recherche sur l'inadaptation psychosociale chez l'enfant - GRIP* (Research Unit on Children's Psychosocial Maladjustment) at the University of Montréal. Without their expertise, some of our survey instruments would have never been computerized to such a high level of quality.

We would like to thank the personnel in the *Service de support aux opérations de la Régie de l'assurance-maladie du Québec - RAMQ* (Operations Support Section of the Québec Health Insurance Board). Without their efficiency, fewer letters of introduction would have found their way to the correct addresses of respondents.

Our sincerest thanks go to our survey firm, *Bureau d'interviewers professionnels (BIP)*. Since 1996, this polling company has been responsible for data collection in the pretests and surveys, and follow-up of families both inside and outside of Québec. Lucie Leclerc, President of *BIP*, has set the standard of quality for our numerous and complex data collections. Assisted by Véronique Dorison, she has instilled in her interviewers a great sense of respect for the respondent families, as well as a rigorous regard for all the norms governing this first-of-a-kind survey in Québec.

A big thank-you to the directors-general, directors of professional services, and staff of the medical records departments of some 80 hospitals in the province who accepted to collaborate in our study at a time when resources were rare and time was at a premium, and when the medical records departments in many hospitals were merging or in the process of doing so. Their support was exceptional. Birthing centres also graciously accepted to participate in this first Québec longitudinal study of children. A special thanks to Julie Martineau, medical records specialist, who contributed to the analysis of indispensable medical information by ensuring very rigorous coding of the data, which often lay concealed in the medical files of the infants and their mothers.

It goes without saying that the staff of *Santé Québec* Division directly attached to ÉLDEQ 1998-2002 are the cornerstone of its success from practically every point of view. Special thanks for their ongoing contribution and constant hard work go to Hélène Desrosiers and Josette Thibault, responsible respectively for analysis of the data and creation of the measurement instruments; Martin Boivin, Rolland Gaudet and Gérald Benoît, who constantly pushed the limits of what computer software can do in terms of programming and data processing; Suzanne Bernier-Messier and Diane Lord, who give meaning to the word versatility, who must organize, code and manage incredible quantities of data to ensure the progress of the study. Not directly attached to the team but who made extremely important contributions are: France Lacoursière, France Lozeau and Thérèse Cloutier, who put the finishing touches to the *Santé Québec* "look" in the survey instruments, reports and conference publications; Lise Ménard-Godin, who conducted fruitful literature searches and advised on many aspects of the collection instruments. The hard work, constant availability, ability to adapt, and finely-honed skills of the people working on this project match the enthusiasm that all our partners have demonstrated in making this study a resounding success.

Finally, I would like to extend a very special thank-you to the 2,223 families who responded to our survey. Thank you for the trust you have shown in *Santé Québec*, our partners and collaborators. Thanks to your participation, your children have become the veritable stars of ÉLDEQ 1998-2002, and are making it possible, in the short term, to gain a better understanding of psychosocial adjustment in children. In the medium and long terms, they will likely be in large part responsible for the establishment of

early detection programs, better designed prevention programs, and more effective interventions for such an important clientele - all of Québec's children.



Mireille Jetté  
Project Coordinator  
*Santé Québec* Division, ISQ

# Introduction of ÉLDEQ 1998-2002

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## Preventing Social Maladjustment

It suffices to consider the costs engendered by behavioural problems in children - school dropout, delinquency, alcoholism, drug addiction, family violence, mental disorders and suicide - to conclude that they largely surpass what a modern society can accept, morally and economically. Faced with the enormity of these problems, the first reflex is to provide services to these people which will, ideally, make the problems disappear, or at the very least, lessen their severity. For many years we have tried to offer quality services to children and adults who suffer from antisocial disorders, alcoholism, drug addiction, depression, and physical or sexual abuse. However, in spite of enormous investment, these curative services are far from being able to respond to the demand.

Although the idea of early intervention as a preventive measure can be traced at least as far back as ancient Greece, the second half of the 20th century will certainly be recognized as the dawn of the field of social maladjustment prevention (Coie *et al.*, 1993; Mrazek & Haggerty, 1994). Numerous programs have been developed for adolescents and teenagers to prevent school dropout, delinquency, drug addiction and suicide. Scientific evaluations of these programs have been far too few in number, but they tend to demonstrate that it is extremely difficult to help those most at risk in this age group (Rosenbaum & Hanson, 1998; Rutter, Giller & Hagell, 1998; Tremblay & Craig, 1995). It is becoming increasingly clear that the factors which lead to serious adaptation problems are in place long before adolescence. Hence the idea that the prevention of social adaptation problems should start at least during childhood, and preferably right from pregnancy (Olds *et al.*, 1998; Tremblay, LeMarquand & Vitaro, 1999). These principles are clearly outlined in the objectives of the *Politique de la santé et du bien-être* (Policy on Health and Well-Being) and *les Priorités nationales de santé publique* (Priorities for Public Health) set by the government of Québec (ministère de la Santé et des Services sociaux, 1992; 1997).

## The Need to Understand Early Childhood Development

If the field of maladjustment prevention appeared at the end of the 20th century, it has certainly come on the heels of child development. "*Émile*," by Jean-Jacques Rousseau, needs to be re-read in light of recent studies to realize just to what degree it is impossible to understand the complexity of child development, and therefore the means of preventing deviant paths, simply by reflection or introspection. Although considerable knowledge has been acquired in the neurological, motor, cognitive, affective and social development of children, what really hits home is that Jean-Jacques Rousseau and his followers in education seemed to have had more certainty about the ways of educating children than we do today.

Progress in child development research has made us realize that things are not as simple as we can or would like to imagine. We have obviously all been children, and most of us have become parents, indeed, relatively well-adjusted ones. But we still do not clearly understand when, how and why adjustment problems appear, and above all, how to prevent and correct them.

Our ignorance is obvious when we examine the debates among specialists on the role of parents in the development of maladjustment problems in children. Some suggest that social maladjustment in children is largely determined by genetic factors (Bock & Goode, 1996; Rowe, 1994). Some accentuate economic factors (Duncan & Brooks-Gunn, 1997). Other researchers attribute a determining role to peer influence (Harris, 1998; Harris, 1995; Vitaro *et al.*, 1997). These larger questions lead to narrower ones which focus on particular aspects - the role of fathers in childhood maladjustment, the impact of alcohol and cigarette consumption during pregnancy, the effect of prenatal and birthing problems, the importance of breast feeding and diet; the role of sleep, cognitive development, temperament, and so on.

The majority of these questions are at the heart of the daily concerns of parents, grandparents, educators, family service providers, and legislators. What can we do to maximize the development of our children, to prevent severe psychosocial maladjustment? What should we do when problems begin to appear, when pregnant mothers, or fathers themselves have

a long history of disorders? The answers to these questions obviously have an effect on the policies put forth by Québec government Ministries such as *ministères de la Famille et de l'Enfance* (Family and Child Welfare), *de l'Éducation* (Education), *de la Santé et des Services sociaux*, *de la Solidarité sociale* (Social Solidarity - formerly Income Security (Welfare)), *de la Sécurité publique* (Public Security), *de la Justice* (Justice), and *le ministère de la Recherche, Science et Technologie* (Research, Science and Technology).

### **The Contribution of ÉLDEQ 1998-2002**

The Longitudinal Study of Child Development in Québec (ÉLDEQ 1998-2002) was conceived in order to contribute to our knowledge of the development of children in their first 5 years of life. The main goal is to gain a better understanding of the factors, in the years of rapid growth, which lead to success or failure upon entry into the school system. The goal of the second phase (if approved) is to better understand development in elementary school, in light of development in early childhood.

We know that this survey cannot be a definitive one on child development in Québec, but it is the first representative study of a provincial cohort of children who will be measured annually from birth to entry into the school system. It specifically aims at understanding the development of basic skills needed for educational success.

Although the effort to set up this study began in 1989, the first data collection coincided with the Québec government's implementation of its *Politique Familiale* (Policy on Families). The policy has virtually the same objectives as our study:

"These services for children 5 years and under should give all Québec children, whatever the socioeconomic status of their parents, the chance to acquire and develop the skills that will allow them to succeed in school (1997, p. 10)."

On March 3 1999, in the speech opening the 36th session of the Québec legislature, Premier Lucien Bouchard confirmed that early childhood development was a priority for the government:

"The theme that will dominate our actions this year, next year, and throughout our mandate, is youth... The

priority...with regards to youth in Québec, begins with the family and childhood... This massive investment in early childhood... will give our children the best chance of success in the short, medium and long terms. It is our best asset against alienation and despair. It is our best preparation for personal, social and economic success."

Because of this historic coincidence, ÉLDEQ has the potential of becoming an invaluable tool for monitoring the effects of Québec's massive investment in early childhood which began in 1997. Thanks to the data collected by the federal government's National Longitudinal Study of Children and Youth (NLSCY, Canada), we will be able to compare child development in Québec with that elsewhere in Canada, before and after the implementation of Québec's new policy on the family.

However, our initial objectives are more modest. The 12 or 13 papers in this series present the results of our first annual data collection. They describe the characteristics of the families and children when the latter were 5 months old.<sup>3</sup> They cover sociodemographic characteristics, nature of the birthing process, health and social adaptation of the parents, family and couple relations, parent-infant relations, and characteristics of the 5-month-old, such as sleep, diet, oral hygiene, temperament, and motor, cognitive and social development. These data will eventually be compared to those on children the same age collected by the NLSCY in 1994 and 1996.

### **An Interdisciplinary, Multi-University Team of Researchers**

This study saw the light of day because of the collaboration of many people. In the preceding pages, Mireille Jetté thanked a number of them. I would like to take advantage of this introduction to emphasize that the survey was set up and continues forward because of the dedication and hard work of a group of researchers from a variety of disciplines and universities. I would particularly like to thank Michel Boivin, School of Psychology at Laval University, and Mark Zoccolillo, Department of Psychiatry at McGill University,

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3. To simplify the text in this report, the phrase "5-month-old infants" will be used to refer to infants whose mean age was 5 months during data collection in 1998. In section 3.1.3 (Volume 1, Number 1), we explain why the infants were not all exactly the same age. As indicated in no. 2 of this series, 52% of the infants were less than 5 months, and 3.4% were 6 months of age or over.

who have been actively involved in this project since 1992. It was in that year that we prepared our first grant application for the Social Sciences and Humanities Research Council of Canada. A second group of researchers joined the team in 1993 and 1994: Ronald G. Barr, pediatrician, Montréal Children's Hospital Research Institute, McGill University; Lise Dubois, dietitian and sociologist, Laval University; Nicole Marci-Gratton, demographer, University of Montréal and Daniel Pérusse, anthropologist, University of Montréal. Jacques Montplaisir, Department of Psychiatry, University of Montréal, joined the team in 1995. Louise Séguin, Department of Social and Preventive Medicine, University of Montréal and Ginette Veilleux, *Direction de la santé publique de la Régie régionale de la santé et des services sociaux de Montréal-Centre* (Public Health Department, Montréal-Centre Regional Health Board), joined in 1998. Three post-doctoral researchers have also made an important contribution. Raymond Baillargeon developed the task for measuring cognitive development. Christa Japel is the assistant to the scientific director for planning, analysis and presentation of the results. Heather Juby collaborates in the analysis of the data on couple and family history.

### **A Unique Confluence of Circumstances**

A study such as this requires the coordination of many researchers over many years, enormous financial resources, and a long period of preparation. Though in the early 1990s the research team was convinced of the need for the survey, those responsible for the public purse had also to be convinced. We must therefore acknowledge the happy confluence of circumstances that allowed the players to take advantage of the opportunity at hand. When a number of civil servants in the *ministère de la Santé et des Services sociaux* understood the essential role of prevention, the creation of a committee on children and youth in 1991 led to an increased awareness of the importance of early childhood. At the same time, the president of the *CQRS*, Marc Renaud, had come to the same realization with his colleagues in the Population Health Program at the Canadian Institute for Advanced Research (CIAR). Aline Émond, the Director of *Santé Québec*, was ready to apply her formidable determination to work for the cause. For their part, Health Minister Jean Rochon and his Assistant Deputy Minister for Public Health, Christine Colin, aware of the importance and benefit of longitudinal studies on early childhood development, authorized the investment of large sums of money during a period of draconian budget cuts. This occurred at the same time as the federal

government decided to create its own longitudinal study of children and youth (NLSCY). It is in this context that ÉLDEQ 1998-2002 materialized. Our survey also came to fruition because Mireille Jetté did everything in her power to make the researchers' dreams a reality, and Daniel Tremblay gave her all the support she needed by making various resources available for the project.



Richard E. Tremblay, Ph.D., M.S.R.C.  
Chair of Child Development  
University of Montréal



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## Review of the Methodology

This analytical paper is one of a series presenting cross-sectional data collected on a large sample of 5-month-old infants surveyed in 1998. It reports on the first of 5 annual data collections on 2,120 children in Québec who will be studied until they are 5 years old. In the first year of data collection, the results on 2,223 infants were retained.<sup>4</sup>

The target population of the survey is Québec babies, singleton births only,<sup>5</sup> who were 59 or 60 weeks of gestational age<sup>6</sup> at the beginning of each data collection period, born to mothers residing in Québec, excluding those living in the Northern Québec, Cree, and Inuit regions, and on Indian reserves, and those for whom the duration of pregnancy was unknown. Due to variations in the duration of pregnancy and the 4 or 5 weeks allotted for each data collection wave, the infants were not all exactly the same age (gestational or chronological) at the time of the survey. Therefore, the children in Year 1 (1998) of the survey had a mean gestational age of 61 weeks - about 5 chronological months.

The survey had a stratified, three-stage sampling design, with a mean design effect for the proportions estimated at 1.3. To infer the sample data to the target population, each respondent was given a weight corresponding to the number of people he/she "represented" in the population. ÉLDEQ 1998 comprised eight main collection instruments which obtained data from the person who was closest to the baby (called the Person Most Knowledgeable - PMK), the spouse (married or common-law), the infant and the absent biological parent, if applicable. Given variation in the response rates to each instrument, three series of weights had to be calculated to ensure inferences to the population were accurate. Except for the Self-Administered Questionnaire for the Absent Father (SAQFABS) and a series of questions in the

Computerized Questionnaire Completed by the Interviewer (CQCI) on absent fathers - the overall or partial response rates of which were too high - the results of all the instruments could be weighted. Therefore, the data presented here have all weighted to reduce the biases.

All data that had coefficients of variation (CV) 15% or higher are shown with one or two asterisks to clearly indicate the variability of the estimate concerned. In addition, if the partial non-response rate was higher than 5%, there is a note specifying for which sub-group of the population the estimate is less accurate.

Similar to any cross-sectional population study, the Year 1 part (5-month-old infants) of ÉLDEQ 1998-2002 has certain limits. However, the vast majority of the results are valid and accurate, and provide a particularly detailed portrait, for the first time, of 5-month-old infants in Québec.

Note to the reader: For more details on the methods, see Volume 1, Number 1 in the present series. Detailed information on the sources and justification of the instruments used in Year 1 of ÉLDEQ 1998-2002, and the design of the scales and indices used in this paper, are covered in Number 12, entitled "Concepts, Definitions and Operational Aspects."

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4. Though the results for 2,223 children were retained for the first year of data collection, 2,120 will be retained for the rest of the longitudinal study; the extra 103 were part of an over-sample used to measure the effects of the January 1998 ice storm.

5. Twins (twins births) and other multiple births were not targeted by the survey.

6. Gestational age is defined as the sum of the duration of gestation (pregnancy) and the age of the baby.



## Temperament

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# 1. Temperament - Current Knowledge

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Philosophers, educators and psychologists have been trying for a long time to explain differences in temperament among human beings. Greek and Roman philosophers proposed the existence of a four fold typology of temperament, that is the melancholic, phlegmatic, sanguine and coleric type. They asserted these types were biological in origin and immutable. This hypothesis of a biological foundation and temporal continuity of temperament is still put forward today.

Research on temperament has mainly focused on adults. It was only in the second half of the 20th century that researchers began the systematic study of individual differences observed in children. The New York longitudinal study was launched in the mid-1950s by Thomas and Chess and constitutes an important contribution to child psychology and psychiatry. These researchers followed 133 babies from birth to adulthood. They identified, defined and measured individual differences and thereby were able to show associations between temperament in early childhood and temperament in adulthood. They showed that three types of temperament in children, namely difficult, easy or "slow-to-warm-up" could be observed in the first months of life. Children who had been identified as having a difficult temperament, for example, had character traits such as a lack of "rhythmicity" in physiological functions, withdrawal when confronted with new stimuli, slow adjustment to changes in their environment and intense emotional reactions (Thomas *et al.*, 1968).

Their studies also revealed that infants with a difficult temperament were at higher risk of facing adjustment problems in the future. A number of recent longitudinal studies have confirmed that a difficult temperament during the first years of life can be a predictor of psychosocial maladjustment in childhood, adolescence or adulthood (Bates *et al.*, 1991; Bates *et al.*, 1985; Caspi *et al.*, 1995; Caspi *et al.*, 1996; Caspi & Silva, 1995; Guerin *et al.*, 1999). These results suggest that temperament may play a significant role in the genesis and evolution of behavioural disorders in children.

According to Thomas & Chess (1977), temperament can be defined as behavioural style. It is "how the child reacts" which differs from ability and motivation. Two children can have the same skills to accomplish a difficult task, and their motivations to accomplish this task can also be identical. However, these two

children may be significantly different in terms of the speed of their physical movements, the ease with which they approach new person or environment, the intensity of their expression of emotion and the effort required to distract them when they are absorbed by an activity.

Although there are several models with respect to the factors that constitute temperament, researchers agree on the fact that an innate style of reactivity and self-regulation is at the origin of individual differences in temperament (Rothbart & Bates, 1998). Individual differences in central nervous system functioning related to behaviour are detectable even before birth and appear to be associated with infant temperament (DiPietro *et al.*, 1996). Since individual behavioural styles are detectable very early in life and prove to have a certain stability over time, some researchers have suggested that temperament has a genetic component (Bates, 1987; Chess, 1990; Goldsmith *et al.*, 1987; Rothbart & Bates, 1998).

However, children do not develop in a vacuum. The family environment can exert an important influence on the innate behavioural tendencies of the child, given that he or she is in constant interaction with the people around him from the fetal period onward. The infant reacts to his family, and in turn can act on his environment (Coffman *et al.*, 1992; Wachs, 1992). In other words, the irritability of an infant with a difficult temperament risks being increased if his mother has difficulty in responding to the particular needs of a difficult baby. On the other hand, an irritable baby who is difficult to console may exhaust the physical and psychological resources of the mother, even if she is quite capable of detecting and responding appropriately to his needs.

According to Werner & Smith (1992), infant temperament may be a risk or a protective factor. In their longitudinal study in Kauai, they showed that in an environment with other risk factors such as poverty and family dysfunction, a child with an easy temperament is less likely to develop socio-affective adjustment problems than a child with a difficult temperament. It is understandable that a difficult baby who is impossible to comfort may elicit less warmth and more hostility on the part of his parents than a baby who can be easily calmed, particularly if the parents are lacking emotional and financial resources.

It is therefore the compatibility between the "nature" of the child and the "nurture" provided by his environment - the "goodness of fit" (Lerner & Lerner, 1983) - that plays an important role in the child's future development and adjustment. An disadvantaged socioeconomic context, social maladjustment or psychological distress in the mother can significantly increase the probability that the baby will present a difficult temperament (Bates *et al.*, 1979; Oberklaid *et al.*, 1990; Vaughn *et al.*, 1987). Recent Canadian data from the National Longitudinal Study of Children and Youth (NLSCY, Canada) revealed that variables such as family functioning, age of the mother, parenting practices and psychosocial adjustment of brothers and sisters can influence a child's temperament (Normand *et al.*, 1996). These results, however, were based on the mother's description of the child's temperament. This source of information on child temperament has often been criticized as subjective. However Bates (1994) and Rothbart & Bates (1998) have demonstrated that the parent may be an effective observer and can provide a relatively accurate and reliable report on the child's behaviour, in part indicating the objective or biological component of a difficult temperament (Bates, 1994). Nonetheless, new longitudinal research is needed to better understand how individual characteristics of the infant interact with those of his environment, and which interactions are associated with developmental variability.

## 2. Longitudinal Study of Child Development in Québec (ÉLDEQ 1998-2002)

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ÉLDEQ 1998-2002 provides an excellent opportunity to advance our knowledge of child development from birth to school age. A particular benefit of ÉLDEQ is that data are collected annually, not only from mothers, but also from fathers. Rarely included in research on infant temperament, fathers are an important source of information to complete the portrait painted by the mother of the context in which the infant is evolving, and particularly the factors that can influence the child's development (Mebert, 1991).

The ÉLDEQ data were drawn from a representative sample of 2,223 Québec infants, with an average age of 5 months at the time of the first data collection in 1998. These data can be used to achieve a number of objectives. The cross-sectional data of the first collection presented in this paper provide a portrait of parental perceptions of infant temperament. In addition, the large number of variables emanating from ÉLDEQ have made it possible to explore the associations between difficult temperament in infants and factors pertaining to family environment. Because of the longitudinal and prospective nature of ÉLDEQ 1998-2002, it will be possible to monitor the developmental pathway of infants perceived as being difficult and perhaps tease apart contributions of the biological component of temperament and environmental characteristics to the psychosocial adjustment of the target children of this study.

The snapshot of the temperament of Québec infants presented in this paper is based on data derived from the Computerized Questionnaire Completed by the Interviewer (CQCI) addressed to the person who best knows the child (PMK<sup>7</sup> - Person Most Knowledgeable) and from the Self-Administered Questionnaire for the Father (SAQF) addressed to the biological father or spouse/partner living in the household.<sup>8</sup>

In ÉLDEQ, a number of questions from the "Infant Characteristics Questionnaire" (ICQ), designed by Bates, Freeland and

Lounsbury (1979), are used to assess infant temperament. Inspired by the factor structure of temperament identified by Thomas and Chess (1977), Bates *et al.* set out to develop and validate a brief questionnaire measuring the degree of difficulty a child presents to his parents. In the ICQ, parents are asked to indicate on a scale of 1 (easy) to 7 (difficult) how they perceive the behaviour of their baby compared to an "average" or "typical" baby. Of the items presented to the mothers and fathers, seven constitute the difficult temperament scale.<sup>9</sup> These questions, asked of both the mother and father in ÉLDEQ 1998, were the following:

- How many times per day, on average, does he/she get fussy and irritable - for either short or long periods of time?
- How much does he/she cry and fuss in general?
- How easily does he/she get upset?
- When he/she gets upset (e.g. before feeding, during diapering, etc.) how vigorously or loudly does he/she cry and fuss?
- On average, how much attention does he/she require, other than for caregiving (feeding, bathing, diaper changes, etc.)?
- When left alone, does he/she play well by him/her self?
- Please rate the overall degree of difficulty he/she would present for the average parent?

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7. In 99.7% of cases, the PMK was the biological mother.

8. Given the low response rates obtained for absent biological fathers (SAQFABS), they were not included in this analysis (for more detail, see No. 1 and No. 2 in this series of papers).

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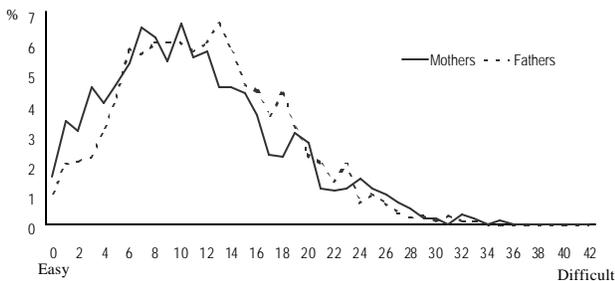
9. The seven items comprising the difficult temperament scale were identified through factor analysis. Cronbach alphas for the mothers and fathers were 0.77 and 0.78 respectively.



### 3. Mothers' and Fathers' Perceptions of their Infant's Temperament

The perceptions of the mothers<sup>10</sup> and fathers<sup>11</sup> of their infant's temperament are presented in Figure 3.1. The distribution of babies on the difficult temperament scale is a curve with a strong bias towards the left. This indicates that the majority of mothers and fathers classified the temperament of their infant as easy rather than difficult.

Figure 3.1  
**Distribution of Infants on the Temperament Scale, by Perception of the Mother and Father, 1998**



Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

At first glance, the two distributions seem to be similar. However, their means were significantly different (11.2 for the mothers vs. 12.0 for the fathers;  $p < 0.001$ ).<sup>12</sup> The description of the infant's temperament by the majority of fathers was located closer to the

mid-point between easy and difficult, whereas that of the majority of mothers was closer to the easy side. Perceiving one's baby as easier than a "typical" one could be an important mechanism fostering mother-infant attachment preserving a sense of confidence as a mother (Elliott *et al.*, 1996). Although there was a slight gap between them on the difficult temperament scale, the perceptions of the two parents were strongly correlated ( $r = 0.59$ ;  $p < 0.0001$ ). The mothers and fathers therefore share, to a certain degree, the perception of their infant's temperament, even if the mode of administering the questionnaires differed, namely face-to-face and self-administered respectively.

10. Due to lack of data, a difficult temperament score could be calculated for only 2,211 infants. In all cases, the PMK was the biological mother.
11. Comprising 1,822 spouses, of which 1,809 were the biological fathers (99.3%), who responded to all the questions used to calculate the difficult temperament score.
12. Data from a number of the ÉLDEQ scales did not follow a normal distribution. Here and in the rest of the paper, when mean comparison tests were done, they were subjected to chi-square tests to confirm the results obtained, categorizing the variables related to the various scales into three equi-probable categories. These analyses confirmed the trends observed in comparing the means. In general, the thresholds of significance observed were close to those obtained in the chi-square tests.



## 4. Contextual Factors Associated with the Perception of Difficult Temperament

The diversity of variables collected from the mother and father provide a means of examining the association between many factors relevant to the infant and/or his family environment and the parents' perception of the infant's temperament (easy or difficult). To study the factors associated with a difficult temperament, boys and girls above the 90th percentile on the difficult temperament scale, namely the 10% comprising the most difficult<sup>13</sup>, were compared to the other infants. Consequently, analyses were conducted on 231 infants described by their mother as having a difficult temperament, that is 118 boys and 113 girls. These were compared to babies fulfilling the easy criterion (1,011 boys and 969 girls). For the fathers, 91 boys and 85 girls were above the 90th percentile on the difficult temperament scale, and these 176 difficult infants were compared to 1,646 "easier" ones (828 boys and 818 girls). Among infants living with both their parents, 11% were identified as having a difficult temperament by one parent, 6% by the mother only and 5% by the father only; 4.6% were considered as such by both parents. Hence, 84% of infants in two-parent families were considered to have an easy temperament by both parents. Let us keep in mind that the correlation between the perceptions of the two parents was 0.59 ( $p < 0.001$ ).

Information on infant and parental factors was derived from the Computerized Questionnaire Completed by the Interviewer (CQCI), the Paper Questionnaire Completed by the Interviewer (PQCI), the Self-Administered Questionnaire for the Mother (SAQM) and the Self-Administered Questionnaire for the Father (SAQF). Data collected by ÉLDEQ also comprised an evaluation of the mother/child interaction by a third person - the interviewer, who filled out the OFL (Observations of Family Life) after visiting the household. The variables included in the analyses can be divided into four groups - infant characteristics, sociodemographic characteristics of the parents and family, prenatal health of the mother and postnatal factors (see Table 4.1).

Table 4.1

**List of Variables Included in the Analyses of Factors Associated with the Perception of Difficult Temperament in the Infant, 1998**

Infant Characteristics	
Gestational age of the infant	<i>ISQ</i> <sup>1</sup>
Low birth weight	CQCI
Sociodemographic Characteristics of the Parents and Family	
Age group (mother and father)	CQCI
Immigration status (mother and father)	CQCI <sup>2</sup>
Educational level (mother and father)	CQCI
Type of family	CQCI
Number of brothers and sisters	CQCI
Socioeconomic status	CQCI
Sufficiency of income	CQCI
Prenatal Health of the Mother	
During the Pregnancy, Consumption of:	
Tobacco	CQCI
Alcohol	CQCI
Prescription, over-the-counter and/or illegal drugs	CQCI
Postnatal Factors	
Postpartum depression	CQCI
Depression at the time of the survey (mother)	CQCI
Depression at the time of the survey (father)	SAQF <sup>3</sup>
Breast feeding	PQCI <sup>4</sup>
Infant sleep habits	PQCI
Family functioning	CQCI
Spousal/partner support perceived by the mother	SAQM <sup>5</sup>
Tobacco consumption at the time of the survey (mother & father)	CQCI
Alcohol consumption in the 12 months preceding the survey (mother & father)	CQCI
Positive parenting practices	CQCI
Perceptions and behaviours (mother)	SAQM
Perceptions and behaviours (father)	SAQF
Degree of stimulation and verbal communication of the mother	OFL <sup>6</sup>

1. *Institut de la statistique du Québec*
2. Computerized Questionnaire Completed by the Interviewer
3. Self-Administered Questionnaire for the Father
4. Paper Questionnaire Completed by the Interviewer
5. Self-Administered Questionnaire for the Mother
6. Observations of Family Life completed by the interviewer

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

13. This cut-off was based on the Thomas and Chess (1977) study that identified 10% of their sample as presenting the profile of a "difficult" temperament. The calculation was done separately for girls and boys to control for differences due to sex.

These variables have been previously identified as being associated with the perception of a child's temperament (Bates *et al.*, 1979; Normand *et al.*, 1996; Oberklaid *et al.*, 1990; Vaughn *et al.*, 1987).

#### 4.1 Infant Characteristics

In terms of infant characteristics, the 1998 ÉLDEQ data revealed that the gestational age of the baby,<sup>14</sup> which varied between 56 and 65 weeks at the time of the survey (for a mean of 60.8 weeks), was not associated with the parental perception of a difficult temperament in the infant. Low birth weight, namely below 2,500 grams, was also not associated with the perception of the infant's temperament at the age of 5 months (data not shown).

#### 4.2 Characteristics of the Parents and Family

Table 4.2 presents the proportion of infants identified by their mother or father as having a difficult temperament according to various sociodemographic characteristics of the parents and family. Perception of the infant's temperament was not associated with the age of the mother or father. Furthermore, parental perceptions of temperament did not seem to vary with the type of family the infant was living in at the time of the survey (intact two-parent, step or mother-headed families), nor with indicators of ethnocultural belonging such as immigrant status or number of years in Canada (data not shown). Mothers having more than two children were less likely to describe their baby as being difficult (7%) compared to those whose infant was the first- or second-born (11%). With regards to the parents' education, only the association between the mother's educational level and the father's perception of the infant's temperament was significant. As shown in Table 4.2, fathers whose spouse/partner had completed post secondary studies were more inclined to report their infant as having a difficult temperament than those whose spouse/partner were less educated (12% vs. 8% or less). Educational level of the father, however, was not associated with the parents' perception of the infant's temperament. Socioeconomic status<sup>15</sup> of the family and insufficient household

income was also found to be associated with the father's perception of the infant's temperament, but not with the mother's. Fathers who described their infant's temperament as difficult had on average a higher socioeconomic status than those who considered their babies "easy" (0.17 vs. 0.02;  $p < 0.01$ ) (data not shown). In similar fashion, fathers in a household above the low-income cut-off were more likely to describe their infant as difficult than other fathers (11% vs. 6%).

Therefore, in general, fathers with higher socioeconomic status were more likely to perceive their infant as being difficult, whereas this was not the case for the mothers. It is possible that these fathers were more involved in caring for the infant compared to other fathers, and were therefore more sensitive to manifestations of difficult temperament in their child.

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14. Gestational age is defined as the sum of the duration of gestation and the age of the baby.

15. Socioeconomic status was established from five sources - educational level of the PMK and the spouse/partner, if applicable,

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occupational prestige of the PMK and spouse/partner, and household income (for more detail, see Willms & Shields, 1996 and No. 12 in this series of papers).

Table 4.2

**Proportion of Infants Perceived by their Parents as Having a Difficult Temperament, by Certain Sociodemographic Characteristics, 1998**

	Difficult temperament according to the mother		Difficult temperament according to the father	
	n	%	n	%
Age group of the mother				
< 20 yrs	73	14.2**	38	7.2**
20-24 yrs	438	8.7*	335	9.1*
25-29 yrs	672	11.6	581	10.0
30-34 yrs	722	10.5	617	10.5
35-39 yrs	251	9.4*	217	8.3*
40 yrs or +	54	10.0**	32	5.0**
Age group of the father				
< 20 yrs <sup>1</sup>	171	11.9*	151	8.8**
25-29 yrs	544	11.3	486	9.5
30-34 yrs	686	10.1	628	10.6
35-39 yrs	435	10.9	397	10.1*
40 yrs or +	173	6.4**	152	6.1*
Educational level of the mother				
No high school diploma	394	10.3	274	5.1 <sup>†</sup> **
High school diploma	753	8.9	618	7.8
Vocational/technical diploma	238	13.7*	195	11.3*
College (junior) diploma	280	11.1*	243	13.5*
University degree	545	11.1	490	12.0
Educational level of the father				
No high school diploma	349	11.1	358	6.9*
High school diploma	679	9.7	574	9.0
Vocational/technical diploma	229	13.2*	196	8.3**
College (junior) diploma	242	8.9*	232	11.6*
University degree	491	10.3	443	11.7
Type of family				
Intact, two-parent	1,762	10.4	1,596	9.8
Stepfamily	240	10.6*	211	9.5*
Single-parent	201	10.8		
Number of brothers and sisters				
None	923	11.6 <sup>†</sup> *	751	8.9
1 brother or sister	882	11.0*	744	11.5
2 brothers or sisters	272	6.5*	223	8.3*
3 and more	135	7.0**	103	5.1**
Annual household income below the low-income cut-off				
Yes	598	9.7	382	6.3 <sup>†</sup> *
No	1,571	10.9	1,417	10.6

Note : <sup>†</sup> indicates  $p < 0.05$ .

1. Fathers under 25 years of age were grouped into one category because of small numbers.

\* Coefficient of variation (CV) between 15% and 25%; interpret with caution.

\*\* Coefficient of variation (CV) higher than 25%; imprecise estimate for descriptive purposes only.

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

### 4.3 Prenatal Health of the Mother

Among the variables related to the prenatal period, lifestyle habits of the mother during the pregnancy did not seem to be associated with her perception, or that of her spouse/partner, of the infant's temperament. Therefore, the baby's exposure to tobacco, alcohol, medications or drugs<sup>16</sup> *in utero* did not appear to be predictors of a difficult temperament at the age of 5 months. Other data related to the mother's health during the pregnancy such as diabetes or hypertension were gathered in the 1998 survey. However, these data, derived from the mothers' medical records, were not available before the writing of this paper. Future analyses will be conducted on them.

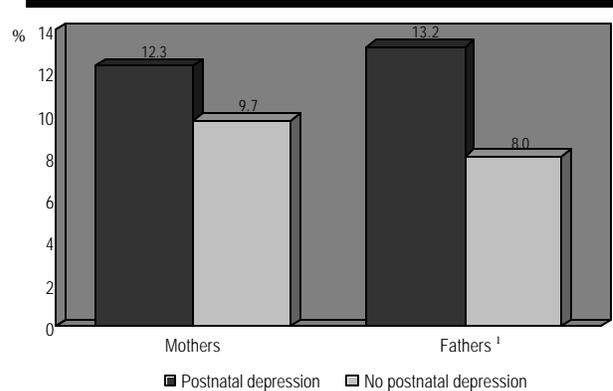
### 4.4 Postnatal Factors

With the exception of postnatal depression in the mother, all the postnatal factors measured for possible associations with the infant's temperament (see Table 4.1) describe the infant's world at 5 months of age. These factors cover various aspects of the child's life. Infant characteristics comprise feeding method and sleep habits, such as whether he or she was sleeping through the night and the number of night awakenings reported by the mother. Variables on the lifestyle habits of the parents and their psychological well-being at the time of the survey are also examined. In addition, analyses also include the mother's perception of spousal/partner support, a description of the parental perceptions and behaviours regarding their infant and a third person's evaluation of the level of stimulation of the infant and verbal communication of the mother.

Maternal perception of the infant's temperament was not significantly associated with having suffered from postpartum depression<sup>17</sup> (12% vs. 10%). However, the results of the analyses indicate that the mother's postnatal depression was associated with the father's

perception of the infant's temperament. As shown in Figure 4.1, fathers whose spouse/partner reported having suffered from postpartum depression were more likely to perceive their baby as having a difficult temperament than those whose spouse/partner indicated they had not (13% vs. 8%).

Figure 4.1  
**Proportion of Infants Perceived by their Parents as Having a Difficult Temperament, by Whether the Mother Reported Postpartum Depression, 1998**



1.  $p < 0.01$ .

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

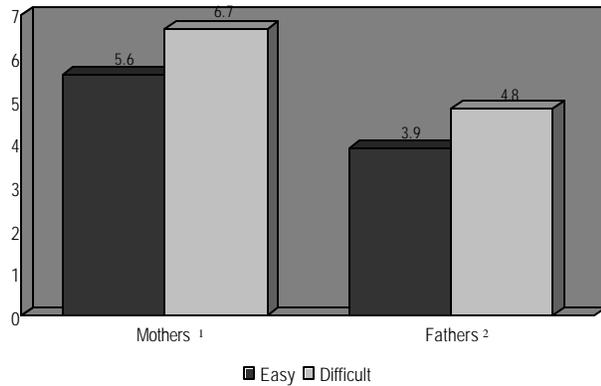
There was a clear association between the psychological well-being of the parents and the infant's temperament following analyses of the symptoms of depression<sup>18</sup> indicated by the mother and father when the baby was 5 months old. As shown in Figure 4.2, mothers who perceived their infant as having a difficult temperament reported more symptoms of depression than other mothers (6.7 vs. 5.6). Similarly, the father's perception of the infant as having a difficult temperament was also associated with the level of depression reported, namely 4.8 for difficult vs. 3.9 for easy.

16. Mothers who responded "Yes" to any of the questions on the consumption of tobacco, alcohol, medications or drugs during pregnancy were compared to those who responded as not having consumed these substances while they were pregnant.

17. Postpartum depression in ÉLDEQ was measured with a single question addressed to the mothers. The percentage of mothers who indicated having suffered from "postpartum depression" may include a certain number who experienced postpartum "blues," which is clinically different from the former.

18. The presence and severity of symptoms associated with depression were measured by a shortened version of the CES-D depression scale developed by L. S. Radoff at the Centre for Epidemiological Studies of the National Institute of Mental Health in the United States. Also used in the NLSCY, this scale indicates only the symptoms of depression; a certain score does not necessarily mean that a parent is suffering from clinical depression.

Figure 4.2  
**Mean Scores of Parents on the Depression Scale, by their Perception of the Infant's Temperament, 1998**



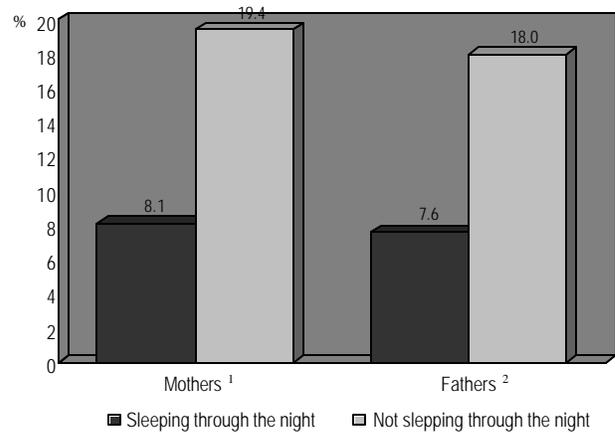
- 1.  $p < 0.01$ .
- 2.  $p < 0.05$ .

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Infant sleep habits were strongly associated with the parents' perception of temperament. As shown in Figure 4.3, infants 5 months of age who were not sleeping through the night were clearly more likely to be perceived as having a difficult temperament than those who were sleeping through the night, by both the mother (19% vs. 8%) and the father (18% vs. 8%). In similar fashion, the proportion of infants described as being difficult by their parents increased significantly with the number of times they interrupted their parents' sleep ( $p < 0.001$ ; data not shown). Approximately 7% of infants who did not interrupt their parents' sleep at night were perceived by their mother as being difficult, whereas the percentage increased to 13% in those who woke their parents three to four times and to 20% in those who did so five times or more a night. Approximately 3% of infants who did not interrupt their parents' sleep were considered to have a difficult temperament by their fathers, whereas this proportion rose to 15% in those who woke their parents three or more times a night (data not shown).<sup>19</sup>

19. With the exception of the 20% figure, the percentages showing the number of night awakenings were based on small numbers and should therefore be interpreted with caution.

Figure 4.3  
**Proportion of Infants Perceived by their Parents as Having a Difficult Temperament, by Whether They Were Sleeping Through the Night at 5 Months of Age,<sup>1</sup> 1998**

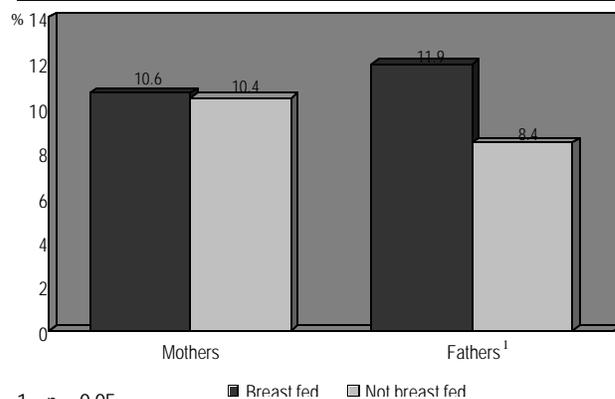


- 1. As reported by the mother.
- 2.  $p < 0.001$ .

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

An interesting result is that the feeding method of the infant seemed to be associated with the father's perception, but not the mother's. Infants being breast fed at the age of 5 months were more likely to be perceived by their father as being difficult than infants who had never been breast fed or had ceased to be (12% vs. 8%) (see Figure 4.4).

Figure 4.4  
**Proportion of Infants Perceived by their Parents as Having a Difficult Temperament, by Whether They Were Breast Fed at 5 Months of Age, 1998**



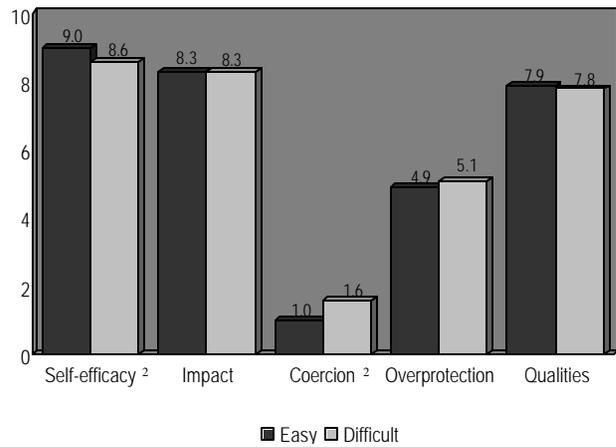
- 1.  $p < 0.05$ .

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Among postnatal factors, parental perception of infant temperament did not seem to be associated with factors such as family functioning, spousal/partner support perceived by the mother, or lifestyle habits of the parents such as smoking at the time of the survey or alcohol consumption in the 12 months preceding the survey (data not shown). However, a number of variables related to the quality of parent/child interactions contributed to the perception of the infant's temperament.

Figures 4.5 and 4.6 show the mean scores obtained by mothers and fathers on the different dimensions of the Parental Perceptions and Behaviours Regarding the Infant Scale (PPBS) according to their perception of the infant's temperament. PPBS - a questionnaire developed specifically for ÉLDEQ - measures six perceptual and behavioural dimensions of the mother and father regarding their infant, namely feeling of self-efficacy, perception of impact, tendency to coercion, parental affection/pleasure,<sup>20</sup> overprotection, and perception of the infant's qualities. As indicated in Figure 4.5, mothers who viewed their babies as difficult were more likely to have hostile and constraining responses to the behaviour of their infant compared to those who perceived their infant as easy (1.6 vs. 1.0). Compared to the latter, the former also perceived themselves as less effective as a parent (8.6 vs. 9.0). Mothers who described their babies as difficult, however, did not differ from other mothers in terms of perception of the impact of their behaviour on their child's development, overprotection, or perception of their infant's physical and cognitive qualities.

Figure 4.5  
**Mean Scores of Mothers on the Dimensions of the PPBS,<sup>1</sup> by their Perception of the Infant's Temperament, 1998**

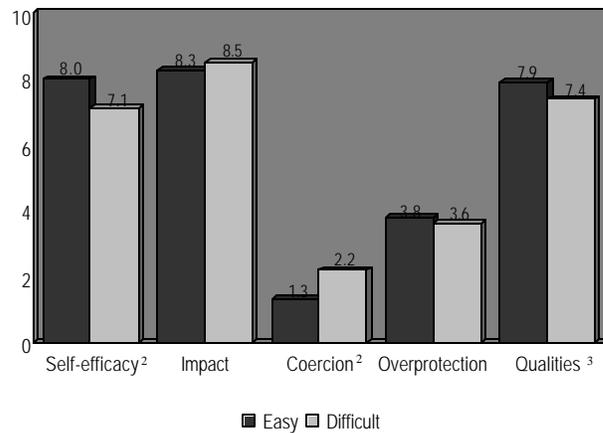


1. Parental Perceptions and Behaviours Regarding the Infant.
2.  $p < 0.001$ .

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

The link between the father's perception of the infant's temperament and the different dimensions of the PPBS is presented in Figure 4.6.

Figure 4.6  
**Mean Scores of Fathers on the Dimensions of the PPBS,<sup>1</sup> by their Perception of the Infant's Temperament, 1998**



1. Parental Perceptions and Behaviours Regarding the Infant.
2.  $p < 0.001$ .
3.  $p < 0.01$ .

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

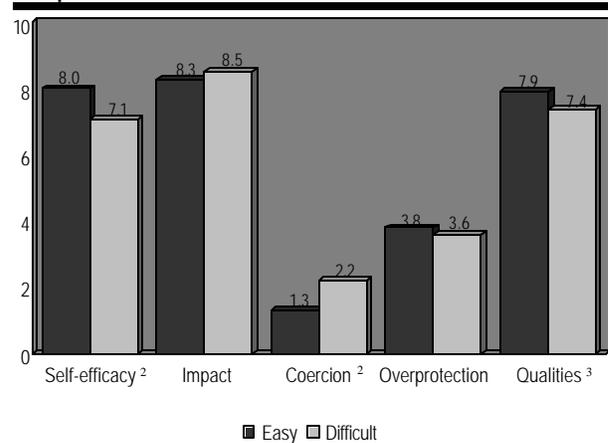
20. Given that the parental affection/pleasure scale was strongly correlated with the parental self-efficacy scale, the former was not retained here (for more details see No. 10 in this series of analytical papers).

Compared to other fathers, those who perceived their baby as difficult considered themselves, on average, a little less effective in their role as parent (7.1 vs. 8.0), and reported resorting more often to coercive behaviours (2.2 vs. 1.3). They also differed from fathers who viewed their infant as easy in that they had a tendency to perceive their infant as less attractive with respect to the child's physical attractiveness and cognitive abilities (7.4 vs. 7.9).

However, it is of note that neither the mother's nor the father's perception was significantly associated with the frequency of positive parenting practices reported by the PMK.<sup>21</sup>

Finally, we wanted to examine in ÉLDEQ 1998 whether there was any association between the quality of the mother/child interaction as evaluated by a third person and the mother's or father's perception of their infant's temperament. The Observations of Family Life (OFL)<sup>22</sup> was filled out by the interviewer following the visit to the household. Two scales from this questionnaire were retained for the analyses here - the infant stimulation scale and the mother's verbal communication (with the infant) scale. The results indicated no significant association between the mother's perception of the infant's temperament and the results of these two scales. However, the father's perception of the infant's temperament was related to certain mother/child interactions. The level of the mother's stimulation of the infant, as observed by the interviewer, was higher in infants perceived by their father as difficult than in other infants (Figure 4.7). This unexpected association may in part be attributed to the fact that the degree of infant stimulation was positively correlated with the mother's educational level (see No. 10 in this series) or to a lesser degree, with the family's socioeconomic status ( $r = 0.16$ ;  $p < 0.001$ ) (data not shown). As seen earlier, these factors were also related to the father's perception of the infant's temperament.

Figure 4.7  
**Mean Scores of Mothers on the Infant Stimulation Scale, by Mother's and Father's Perception of the Infant's Temperament, 1998**



1.  $p < 0.05$ .

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

In summary, the results of these bivariate analyses suggest that a number of environmental factors are related to parents' perceptions of their infant's temperament. In mothers, the quality of the infant's sleep and his/her birth order, the mother's psychological well-being, her feeling of parental self-efficacy and the quality of her interactions with the infant were the main factors associated with her perception of the infant's temperament. In fathers, reported symptoms of depression, educational level of the mother, socioeconomic status of the family, sleep habits, feeding method, as well as certain attitudes and behaviours of the father regarding the infant, were associated with his perception of the infant's temperament.

Although many of the associations were relatively weak, they confirm the results obtained in other studies of infant temperament. For example, these have revealed that depression in the parents (Daniels *et al.*, 1984; Mebert, 1991; Sameroff *et al.*, 1982; Vaughn *et al.*, 1987), birth order (Bates *et al.*, 1979) and the quality of the parent/infant interaction (Lee & Bates, 1985; Normand *et al.*, 1996; Seifer *et al.*, 1996) seem to be associated with parental perceptions of difficult infant temperament.

A number of authors have suggested that socioeconomic status or its components can contribute to the mother's evaluation of her infant's temperament (Bates *et al.*, 1979; Oberklaid *et al.*, 1990;

21. This 5-item scale, part of the CQCI, was derived from the NLSCY. It measures the frequency of positive interactions such as playing, speaking, laughing, doing activities with and enjoying the baby.

22. The Observation of Family Life (OFL) is an adapted and abridged version of the HOME, developed by B. Caldwell & R. Bradley (for more detail, see No. 12 in this series of papers).

Sameroff *et al.*, 1982). However, the 1998 ÉLDEQ results showed no association between the family's socioeconomic status and maternal perception of difficult temperament in the infant. In the fathers, however, socioeconomic status, or more precisely, household income, and the mother's educational level, were associated with paternal perception of the infant's temperament. However, contrary to what was expected, the associations were in the opposite direction. Having a higher socioeconomic status, a more educated spouse/partner and a household income above the low-income cut-off (as defined by Statistics Canada) increased the likelihood that the father would rate his baby as having a difficult temperament. Given that the family's socioeconomic status was associated with certain aspects of spousal/partner support perceived by the mother and the latter was associated with paternal self-efficacy (see No. 10 and No. 11 in this series), the results of this analysis possibly reflect a more marked engagement on the part of certain fathers in caring for the infant. Fathers with higher socioeconomic status may more frequently witness times when the baby is more difficult or irritable, and therefore be more sensitive to these behaviours in their child.

The final association observed in the fathers and to be commented on is the link between the perception of the infant's temperament and the feeding method of the baby at the time of the survey. Although the maternal perception of the infant did not vary with the feeding method, infants who were still being breast fed at the age of 5 months were more likely to be perceived by their father as difficult compared to those who had never been breast fed or had ceased to be. Calming an infant who is often irritable and fussy because he is hungry can indeed be a challenge for a father. Not being able to respond to the needs of the infant by feeding him, for example, may increase the father's distress resulting in a greater likelihood to perceive his child as difficult. However, this result may also be due to the fact that the feeding method of the child was associated with the family's socioeconomic status (see No. 5 in this series), a factor which in turn increases the probability that a father would perceive his baby as being difficult.

The sleep habits of the infant, namely whether he was sleeping through the night and the number of night awakenings, were strongly associated with the perceptions of both mothers and fathers of the infant's temperament. This may be interpreted in several ways. On the one hand, it may suggest that the stress of chronic lack of sleep makes the baby more irritable and demanding, therefore

objectively more difficult (Weissbluth, 1989). On the other hand, it can be easily imagined that parents whose sleep is often interrupted by their infant crying are exhausted and more likely to perceive their child as being difficult. Viewed another way, sleep itself seems to be an aspect of temperament. In the ICQ, for example, the degree to which it is easy or difficult to predict when the baby will sleep or wake up is part of the four factors of temperament identified by Bates *et al.* (1979). However, sleep is one of the items of the "unpredictable" factor<sup>23</sup> and not among those describing a difficult temperament. It is possible that sleep as a component of temperament has a biological foundation. Therefore, an acute sensitivity to external stimuli may reduce the quality of an infant's sleep. Given the strong association between sleep habits and difficult temperament, it seems that the latter may in part be defined by sleep problems. Number 4 in this series of analytical papers presents a detailed portrait of the sleep of Québec infants and the environmental factors associated with it.

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23. The "unpredictable" factor comprises items such as to what extent it is easy or difficult for the parent to foresee when the baby is hungry, to know what will disturb him, or predict when he will need his diaper changed.

## 5. The Best Predictors of Difficult Temperament in Infants

After establishing a good number of associations between parental perception of the infant's temperament and variables pertaining to the infant, parents and their environment, the question is what factors among those related to a difficult temperament can best predict whether a mother or father describes the infant as being difficult. Therefore two logistical regression analyses were conducted, in which groups of variables significantly associated with the description of a difficult temperament were entered (see Table 4.1).<sup>24</sup>

The summary of these analyses is presented in Tables 5.1 and 5.2. As these tables show, some variables which entered into the equation at the beginning did not seem to exert a significant effect on the perception of the parents once all the factors were taken into account. For the mothers, the number of children, their educational level<sup>25</sup> and symptoms of depression no longer contributed to the perception they had of their baby once the parenting perceptions and behaviours scale (PPBS) was added to the analysis (Table 5.1). In fathers, the effects of the mother's educational level and father's symptoms of depression on the perception of the infant's temperament became non-significant when some sub-scales of the PPBS were entered into the equation. In addition to the variables characterizing the interaction between parent and child, the quality of the infant's sleep was an important predictor of the infant's temperament as perceived by both mothers and fathers (Tables 5.1 and 5.2). Compared to babies who did not interrupt their parents' sleep, those who did so three or four times

a night were four times more at risk of being perceived by their father as being difficult. Note that the mothers seemed more "tolerant" of their sleep being interrupted. It was only after five or more interruptions that they were more likely to perceive their infant as having a difficult temperament.

Table 5.1  
**Summary of Logistical Regression Analysis - Mother's Perception of Difficult Temperament in the Infant, 1998**

Variables dans l'équation	$\beta$	p	Relative risk
Number of brothers and sisters		not signif.	-
Educational level of the mother		not signif.	-
Depression in the mother		not signif.	-
Sleep interrupted by the infant <sup>1</sup>			
Once or twice	0.11	0.65	not signif
3 or 4 times	0.56	0.05	1.74
5 times or more	1.05	0.000	2.85
Parental self-efficacy (mother) <sup>2</sup>	- 0.26	0.000	0.77
Coercive behaviour (mother) <sup>2</sup>	0.19	0.001	1.26
Coercive behaviour (father) <sup>2</sup>	0.14	0.01	1.23

1. The comparison group comprised infants who did not interrupt their parents' sleep during the night.
2. The relative risk was calculated using one (1) standard deviation above the mean.

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Table 5.2  
**Summary of Logistical Regression Analysis - Father's Perception of Difficult Temperament in the Infant, 1998**

Variables in the equation	$\beta$	p	Relative risk
Educational level of the mother		not signif	-
Depression in the father		not signif	-
Sleep interrupted by the infant <sup>1</sup>			
Once or twice	1,07	0,001	2,90
3 or 4 times	1,50	0,000	4,47
5 times or more	1,57	0,000	4,81
Parental self-efficacy (mother) <sup>2</sup>	- 0,22	0,01	0,80
Parental self-efficacy (father) <sup>2</sup>	- 0,27	0,000	0,67
Coercive behaviour (father) <sup>2</sup>	0,30	0,000	155

1. The comparison group comprised infants who did not interrupt their parents' sleep during the night.
2. The relative risk was calculated using one (1) standard deviation above the mean.

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

24. The following variables were entered into the two regressions: mother's educational level, number of brothers and sisters, sufficiency of income, postpartum depression, parental depression at the time of the survey, infant feeding method, number of night awakenings of the infant, maternal and paternal self-efficacy and tendency to coercion (PPBS), father's perception of the infant's qualities (PPBS) and the degree of stimulation of the infant by the mother as observed by the interviewer. It should be noted that in the bivariate analyses, some of these variables revealed an association with the perception of the infant's temperament on the part of only one of the two parents.
25. Although in the bivariate analysis, educational level of the mother was not associated with her perception of the infant's temperament, this variable had an effect in the logistical regression.

With regards to the Parental Perceptions and Behaviours Regarding the Infant Scale (PPBS), parental self-efficacy and the tendency to coercion contributed in a significant manner to the perception of the infant's temperament. For example, if the result obtained by the mother on the parenting self-efficacy scale was located at one standard deviation above the mean, the relative risk of her perceiving the infant as difficult decreased by a factor of 0.77, or in other words, was 23% lower (see Table 5.1). In contrast, the probability that a baby was perceived as difficult by the mother was higher when the mother (1.26) or the father (1.23) reported resorting to more coercive behaviours (one standard deviation above the mean).

Similar results were observed regarding the father's evaluation of the infant's temperament. The relative risk of the father perceiving the infant as having a difficult temperament was lower than 1 when he or his spouse/partner reported a greater feeling of parental self-efficacy, namely 0.67 and 0.80 respectively. Fathers reporting a higher tendency to coercion presented a relative risk 55% higher (risk ratio 1.55) of describing the temperament of their infant as difficult (see Table 5.2). These results indicate a strong association between parenting attitudes and behaviours and the perception of the infant's behaviour. This association seems to increase as the child ages (Landy & Tam, 1998).

These results suggest that having controlled for the effects of other variables, parental self-efficacy, the nature of the parent/infant interaction and the quality of the infant's sleep were the best predictors of the parents' perception of the infant's temperament. It is not surprising that the infant's quality of sleep remained strongly associated with difficult temperament once the other factors were taken into account. Not interrupting the parents' sleep seems to be an important component of the infant's temperament or, at the very least, a characteristic parents strongly associate with an easy baby.

With regards to parental attitudes and behaviours, these seemed linked to both the infant's temperament and certain characteristics of the parents. Depression in the mother, for example, was negatively correlated with her feeling of self-efficacy as a parent ( $r = -0.13$ ;  $p < 0.001$ ) and positively with coercive behaviours towards the baby ( $r = 0.22$ ;  $p < 0.001$ ). Fathers reporting a high level of depressive symptoms were also more likely to feel less effective as a parent ( $r = -0.25$ ;  $p < 0.001$ ) and show more coercive

behaviours ( $r = 0.23$ ;  $p < 0.001$ ) (data not shown).<sup>26</sup> These results suggest that parenting attitudes towards the infant are variables that mediate the effect of parental characteristics (such as education and depression) on their perception of the infant's difficult temperament. The data collected in Year 1 (1998) of ÉLDEQ, are cross-sectional, and therefore no cause-effect relationship can be inferred given that they were collected simultaneously.

Nevertheless, these data show that the parents' description of the infant's temperament comprise several elements. On the one hand, the data suggest that parental characteristics are associated with the perception of the infant. On the other hand, the strong correlation between the perception of both parents of the infant, along with the fact that all of the contextual factors examined explained only a small proportion of the variance, namely 9% in the mothers and 14% in the fathers, suggests that the parents' evaluations may reveal an objective component of an infant's difficult temperament. The associations indicated by the analyses can be interpreted in a number of ways. For example, the association between the perception of a difficult temperament in the infant and coercive behaviours in the parents suggests that a negative interaction style may have developed between parents and their baby (van den Boom & Hoeksma, 1994). However, it remains to clarify to what degree the infant is reacting to parental behaviours and to what degree the parents are reacting to the infant's temperament. The longitudinal data of ÉLDEQ 1998-2002 will help gain a better understanding of the contribution of the two parents and the child to this interaction, particularly of the relationship of parenting practices to the developmental trajectories of these children.

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26. Tests on the Pearson correlation coefficients were conducted even if the PPBS scores showed abnormal and strongly biased distributions. As a result, coefficients with weak values are presented for descriptive purposes only.

## 6. Conclusion

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Several researchers have suggested that interaction style and parenting practices, such as the manner in which children are disciplined, are important factors in the development of adjustment problems in children (Hart & Risley, 1995; Rutter, 1989; Werner, 1989, 1993). Analyses of data from the National Longitudinal Study of Children and Youth (NLSCY, Canada) have revealed that hostile and ineffective parenting practices are associated with hyperactive behaviours, conduct disorder, affective disorders, as well as social and school problems in children (Landy & Tam, 1996, 1998). In a recent study, Chao & Willms (in press) noted that parenting practices are more strongly associated with social adjustment and cognitive development in children than family characteristics and socioeconomic status.

The origins of adjustment problems in children may be attributable to the incompatibility between infant temperament and parenting style, which seems to increase the probability of future behavioural maladjustment (Thomas *et al.*, 1968). Both child temperament and parental behaviours towards the child are therefore important risk or protective factors in child development (Werner & Smith, 1992). Lee & Bates (1985) observed that children with a difficult temperament have a more negative reaction to the mother's attempts to control their behaviour. At the same time, these mothers tend to use more intrusive control strategies than those whose children have an easy temperament. Again this suggests that a cycle of coercion and negative control may establish itself between a difficult baby and his/her parents, and this is very likely to become a vicious circle of endless conflict between parents who try to control their child through ineffective means on the one hand, and the child who reacts with increasing resistance on the other. This vicious circle risks remaining unchanged without appropriate intervention (van den Boom & Hoeksma, 1994).

Fostering the positive development and social adjustment of children and youth, thereby reducing the prevalence of behavioural problems in children by 2002, is one of the public health priorities of Québec (ministère de la Santé et des services sociaux, 1997). To attain this objective, it seems of great importance to implement ongoing assistance and support services for parents from pregnancy to their children's entry into the school system. Although targeting the populations most at risk is a worthwhile priority, other families with young children presenting adjustment

problems should also be provided with adequate support. All children need good parents. Therefore, equipping all parents with the means of appropriately responding to the particular needs of their child cannot help but increase the feeling of parental self-efficacy and the quality of the parent/child relationship. These are important protective mechanisms that can reduce the chances that a child will find himself on a developmental pathway that will compromise his future psychosocial adjustment.



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## Glossary

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<i>Centre de la petite enfance</i>	Child-care centre
<i>Commission d'accès à l'information du Québec - CAI</i>	Québec Access to Information Commission
<i>Conseil québécois de la recherche sociale (CQRS)</i>	Social Research Council of Québec
<i>Direction de la méthodologie et des enquêtes spéciales, ISQ</i>	Methodology and Special Surveys Division, ISQ
<i>Direction de la santé publique de la Régie régionale de la santé et des services sociaux de Montréal-Centre</i>	Public Health Department, Montréal-Centre Regional Health Board
<i>Direction de la technologie et des opérations statistiques, ISQ</i>	Technology and Statistical Operations Division, ISQ
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<i>Direction Santé Québec, ISQ</i>	Health Québec Division
<i>Étude des jumeaux nouveaux-nés au Québec - ÉJNQ</i>	Québec Study of Newborn Twins
<i>Fichier maître des naissances</i>	Master Birth Register
<i>Fonds de la recherche en santé du Québec (FRSQ)</i>	Health Research Fund of Québec
<i>Fonds pour la formation de chercheurs et l'aide à la recherche (FCAR)</i>	Researcher Education and Research Assistance Fund
<i>Groupe de recherche sur l'inadaptation psychosociale chez l'enfant - GRIP</i>	Research Unit on Children's Psychosocial Maladjustment
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<i>ministère de la Sécurité publique</i>	Ministry of Public Security
<i>ministère de la Solidarité sociale</i>	Ministry of Social Solidarity - formerly Income Security (Welfare)
<i>Politique de la santé et du bien-être</i>	Policy on Health and Well-Being
<i>Service de la recherche</i>	Research services
<i>Service de support aux opérations de la Régie de l'assurance-maladie du Québec - RAMQ</i>	Operations Support Section of the Québec Health Insurance Board



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This paper is one of a series comprising Volume 1 of: JETTÉ, M., H. DESROSIERS, R. E. TREMBLAY and J. THIBAUT (2000). *Longitudinal Study of Child Development in Québec (ÉLDEQ 1998-2002)*, Québec, Institut de la statistique du Québec, Vol. 1.

The following is a list of all the analytical papers in Volume 1 available or planned as of this date:

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