

BIRTH WEIGHT, EARLY BIRTH, AND READINESS TO LEARN AT SCHOOL AT 5 YEARS

Magdalena Janus and David R. Offord
The Canadian Centre for Studies of Children at Risk
McMaster University
(Presented at the SRIP Meeting, Oxford, UK, September 2001)

Unpublished data; please do not quote without permission

INTRODUCTION

Seriously compromised birth circumstances tend to be associated with long-term sequelae in cognitive and socio-emotional outcomes, which are often consequences of additional medical problems. If easily-recorded characteristics are reliably related to lower success later in school, these characteristics can be used to focus more resources on children who need them right from birth. The goal of the overall project, investigating the levels of children's readiness to learn at school entry as the outcome of the early years' experience, is to provide communities with knowledge for implementation of programs for children 0-5 and their parents.

In this study we address the long-term effects of moderately compromised birth circumstances on children's readiness to learn at school before entry to Grade 1 in five community populations. All these children attend regular schools and over 95% have no special health problems.

Between 1997-1999, the Canadian Centre for Studies at Risk at McMaster University developed the Early Development Instrument (EDI), an assessment of readiness to learn at school among kindergarten-age children, prior to their entry to Grade 1. The EDI is a teacher-completed checklist, which can only be interpreted at a group-level. Since 1998/99 until the current school year, the EDI was completed for over 90,000 children in over 20 communities across Canada.

The sample for this study consisted of 1902 children from five sites in Canada born in 1994 and 1995. The birth data and any other information prior to the kindergarten (reception) assessment was collected retrospectively by interviewing the parents when children were 5-years old. Their readiness to learn at school was assessed using the EDI. In this study we attempt to answer the question whether such easily accessible variables like birth weight and early birth are related meaningfully to readiness to learn at school, and therefore can be used by communities as a basis for early intervention.

METHODS

SAMPLE

The sample consisted of 1902 5-year-old children from five sites in Canada. These children were selected as a representative sample of all 5-year-olds living in each of these sites.

MEASURES

Early Development Instrument (EDI)

- In the Spring of their pre-Grade 1 school year (called kindergarten, senior kindergarten, or reception), teachers of these children completed the Early Development Instrument (EDI). The EDI is a 100-item checklist comprising questions relevant to a child's readiness to learn at school in five domains: **physical health and well-being, social competence, emotional maturity, language and cognitive development, and general knowledge and communication skills**. Scores in each domain vary from 0 (worst) to 10 (best). A **Total** score was a sum of the five scores (used only for regression analysis).
- In addition to domain scores, an index of **increased need** in readiness for school is assigned as 1 if a child scores fall in the lowest 10th percent of all scores in at least one of the five domains; and as 0 if the child's scores are higher than the lowest 10th percentile in all domains.

Birth Characteristics

Data on children's birth weight and timing of birth were collected retrospectively from parents during an interview when children were 5 years old.

Birth weight

Birth weight was classified as **Low**, if it was less than 2500g. The incidence of low birth weight in the sample was 5.9% (113/1902), which is exactly the same as reported for all Canadian newborns in 1994.

Early birth

Birth was classified as having happened **Early** if a child was born 3 or more weeks before due date. 9.4% (179/1902) of children in the sample were born early. There are no national norms for these data.

Additional demographic variables (e.g., family income, parent education) were also collected during the interview with parents.

Sample categorisation

Based on the two children's birth characteristics (weight and timing), they were classified into four categories:

Birth weight	Birth timing	Code	N	% of sample	Mean birth weight (g)	Mean born before due date (weeks)
Low	Early	LBW/ET	67	3.5	1876	6.8
Low	Normal	LBW/NT	46	2.4	2329	0.9
Normal	Early	NBW/ET	112	5.9	3124	3.8
Normal	Normal	NBW/NT	1677	88.2	3530	0.4
<i>Full sample</i>			<i>1902</i>	<i>100</i>	<i>3416</i>	<i>0.8</i>

Selected demographic characteristics of families of children in each of the four categories are presented below.

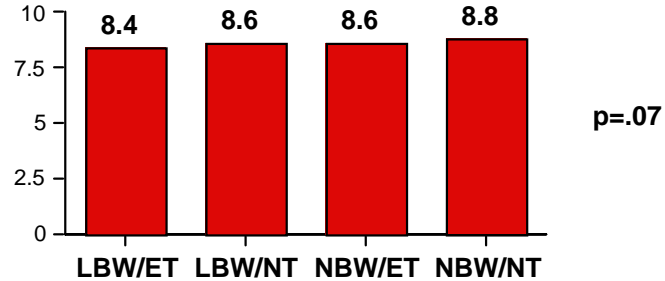
Category	Mean family income* range (Can\$)	Mean parental education (years)	Percent boys	Percent from non-English-speaking families
LBW/ET	50-59,000	11.4	57.6	15.6
LBW/NT	40-49,000	11.9	37.8	9.1
NBW/ET	50-59,000	12.1	65.8	8.3
NBW/NT	50-59,000	12.2	48.4	10.4
<i>Full sample</i>	<i>50-59,000</i>	<i>12.1</i>	<i>50.5</i>	<i>10.4</i>
Difference significant?	Yes P<.01	No	Yes P<.01	No

*recoded into \$10,000 increments

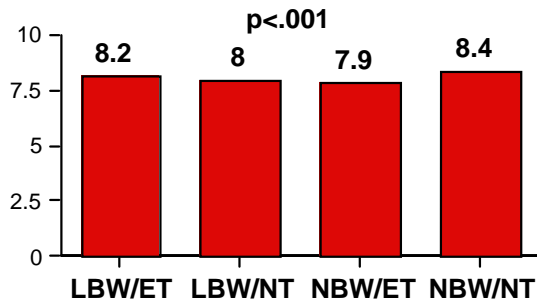
Due to the significant differences among groups in family income and gender, analyses of school readiness-to-learn scores were controlled for these two variables.

RESULTS
COMPARISON OF THE READINESS-TO-LEARN DOMAINS

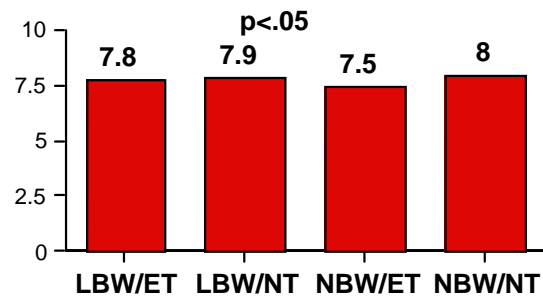
Physical health and well-being



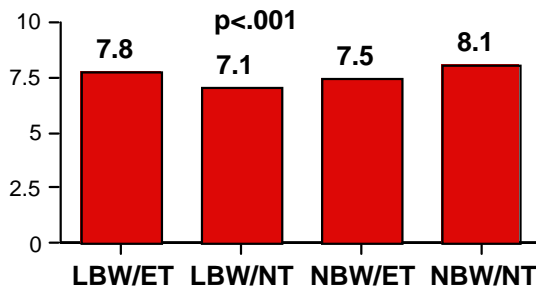
Social competence



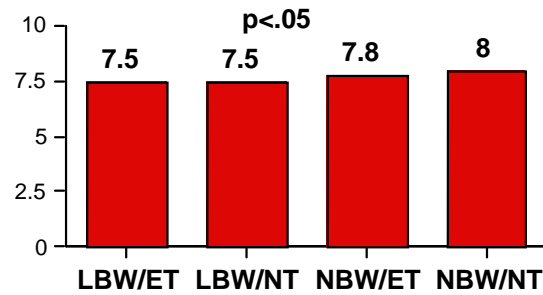
Emotional maturity



Language and cognitive development



Communication skills



P-levels refer to the results of multivariate analysis of variance, controlled for gender and family income. The four groups differ significantly at $p < .05$ on all domains except for Physical Health.

In addition, the following differences between groups were significant:

- The Normal BW/Early Time group was significantly lower than the Normal BW/Normal Time group on Social Competence, Emotional Maturity and Language and Cognitive Development (Post-hoc Tukey $\alpha < .01$)
- The Low BW/Normal Time group was significantly lower than the Normal BW/Normal Time group on Language and Cognitive Development (Post-hoc Tukey $\alpha < .01$)

INCREASED NEEDS INDEX

Children with low birth weight and/or early birth were more likely to score in the lowest 10th percentile on one or more scales ($\chi^2 = 16.67$, $df=3$, $p<.001$). The national value of this index for 1999/2000 school year was 24.5%. Children with normal birth weight and timing were also the least likely to score low in two or more readiness to learn domains ($\chi^2 = 17.32$, $df=3$, $p<.001$).

Category	Increased Needs Index (1 or more low score)	Two or more low scores
LBW/ET	32.8% (22/67)	17.9% (12/67)
LBW/NT	30.4% (14/46)	17.4% (8/46)
NBW/ET	32.1% (36/112)	18.8% (21/112)
NBW/NT	20.1% (337/1677)	9.2% (155/1677)
<i>Full sample</i>	<i>21.5% (409/1902)</i>	<i>10.3% (196/1902)</i>

PREDICTORS OF READINESS-TO-LEARN

A stepwise regression was carried out to explore to what extent family sociodemographics (income and parent education), and birth and child characteristics (birth weight, born weeks before due date, and gender) contribute to child's readiness to learn at school. The Total EDI score (sum of the five domain scores) was used as the outcome.

Variable	R square change	Beta coefficient	P (of change)
Family income	.023	-.153	.000
Gender	.020	.140	.000
Parent education	.005	-.071	.025
Birth weight	.002	-.046	.130
Total explained	.050		

While income, gender and parent education explained the most variance in readiness to learn, birth characteristics also added to the proportion of explained variance.

DISCUSSION

In summary:

1. Children who experienced compromised birth circumstances (low birth weight, early birth) are more likely than others to have lower readiness to learn at school prior to Grade 1 entry.
2. Interestingly, children who were born early appeared to have more problems in the area of social/emotional competencies, while those with low birth weight demonstrated more problems in the language, cognitive and communication areas. This may indicate two different mechanisms at work, and is a finding that deserves further, more detailed and prospective study.
3. Most of the results are independent of gender and income.
4. While family income contributes most to the variance in low readiness to learn, birth circumstances also contribute a small amount of variance.

These analyses, although general and relatively superficial demonstrate clearly that birth circumstances have an important impact on children's readiness to school five years later.

Even if, statistically, most of the variation in readiness to learn is explained by other variables, these two aspects of a child's birth, usually well-remembered by parents, are reliable markers of possible "at risk" status.

In total, just over 11% of the sample have experienced compromised birth circumstances. Whatever the mechanisms linking this group to lower readiness to learn at school, these children may have benefitted from participating in programs nurturing and supporting young children and their parents. This study shows that the birth variables investigated here could easily be used to encourage communities to create programs for very young children, and families to participate in them.

REFERENCES

Doherty G. Zero to Six: The basis for school readiness. Human Resources Development Canada. R-97-8E. 1997. Ottawa.

Janus M, Offord DR. Reporting on readiness to learn in Canada. *ISUMA Canadian Journal of Policy Research* 2000; 1:71-75.

ACKNOWLEDGMENTS

This study was carried out in collaboration with the National Longitudinal Survey of Children and Youth, Human Resources Development Canada

For further information please contact:

Magdalena Janus

The Canadian Centre for Studies of Children at Risk, McMaster University

1200 Main Street West, Hamilton, Ont. L8N 3Z5, Canada

Phone: (905) 521-2100 ext. 74377

E-mail: janusm@mcmaster.ca