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Childcare Policy and Cognitive Outcomes of Children: Results from a Large Scale Quasi-Experiment on Universal Childcare in Canada

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Abstract:
Effects of a low-fee universal childcare policy, initiated in Québec, the second most populous province in Canada, on the cognitive development of preschool children are estimated with a sample of 4- and 5-year-olds (N=8,875; N=17,154). In 1997, licensed and regulated providers of childcare services began offering daycare spaces at the reduced fee of $5 per day per child for children aged 4. By 2000, the low-fee policy applied to all children aged 0 to 59 months (not in kindergarten). The study uses 6 cycles of biennial data drawn from Statistics Canada's National Longitudinal Survey of Children and Youth (1994-2004) and quasi-experimental estimation methods to provide evidence that the policy had substantial negative effects on preschool children's Peabody Picture Vocabulary Test scores. The negative effects are found to be stronger for children with mothers who have lower levels of education.

1. Introduction

Early childhood education and care (ECEC) has become a major concern for policy makers around the world. The relationship between ECEC and the developmental outcomes of children has been widely studied from a variety of perspectives. One strand investigates the potential benefits of early intervention childcare and/or remedial/compensatory education programs (Barnett, 1995; Karoly et al. 1998; Carneiro and Heckman, 2003; Currie, 2001; Blau and Currie, 2006; Love et al., 2005). Another examines the effects of maternal employment and childcare during preschool years on developmental outcomes (Walfogel, 2002). These two strands of the literature can be further divided into two types of studies. The first, produced almost entirely in the United States, are based on the evaluation of 'model' or demonstration programs by experimental methods wherein children are randomized into experimental (children at risk are submitted to particular types of interventions including childcare outside of the home) and control groups. The second (the large majority) are quasi-experimental and observational, some of them based on longitudinal data. Although these studies are diverse in terms of period under study, samples and comparison groups, conceptual and analytical methods, chosen covariates in regression analyses, and statistical treatment of omitted variables, heterogeneity or selection bias problems (Blau, 2003; Blau and Currie, 2006), there is a growing body of evidence that some ECEC interventions can lead to both short and long term gains for young children be they cognitive or non-cognitive (emotional outcomes or social skills). However, little has been learned about the relationship between ECEC and child outcomes in settings outside the United States (Waldfogel, 2002).

This study presents results from a large scale "natural" policy experiment in Canada potentially affecting children from all income groups and with a particular relevance for the school readiness of older preschool children. Given that most ECEC policies in the United States

are targeted towards disadvantaged children, the results can be very useful to policy makers more interested in universal childcare programs.

On September 1 1997, the government of Québec, the second most populated province in Canada, implemented a new childcare policy. From that day on, regulated and licensed childcare service providers began offering daycare spaces at the reduced fee of $5 per day per child for children aged 4. In successive years, the government reduced the age requirement and, by September 2000, the low-fee policy applied to all children aged 0 to 59 months (i.e. children not eligible for kindergarten). The government also promised to progressively increase the number of low-fee $5 per day daycare spaces, targeting a number of 200,000 for 2007 (approximately 60% of children less than 5-years-old). The number of partly subsidized spaces increased from 77,000 (available in late 1997) to 199,000 spaces, totally subsidized (except for the 5$ cost), by March 2007 (see Table 1). This new childcare policy was integrated within a larger family policy that included other changes in education policy such as the extension of half-day publicly-provided kindergarten in a school setting to full-day kindergarten and $5 per day before- and after-school daycare for kindergarten-age and grade-school children. No such important policy changes for preschool (including kindergarten) children were enacted in the nine other Canadian provinces over the years 1994 to 2004 (Friendly et al., 2007).

The policy pursued two major objectives: fight family poverty by increasing mothers' participation in the labor market and enhance child development and equality of opportunity for children. Direct public subsidies in Québec to childcare providers increased from $209 million in fiscal year 1995-96 to $1.6 billion in year 2006-07 (all monetary amounts are expressed in Canadian dollars). Despite the substantial amount of public funds dedicated to this program (see Table 2 for the amount of public funds spent for the childcare policy) very few studies (reviewed below) have examined whether the objectives have been reasonably met. It is important, we

believe, to use this experiment as a beacon to form expectations about the impacts of this type of universal childcare policy, as well as anticipate the problems that could emerge if it were replicated elsewhere.

In a series of papers (Lefebvre and Merrigan 2005a, 2005b, 2008; Lefebvre et al., 2008; Baker et al., 2005, 2008), empirical evidence is presented on the effects of the policy on labor force participation. In particular, it shows that the policy produces both a large short-term and long-term increase in the labor supply of mothers with pre-school children as measured by participation in the labor market or annual hours of work. Furthermore, it is also shown that families' childcare arrangements in Québec, but not in the 9 other provinces, changed dramatically over time as the policy favored regulated subsidized center-based care as well as family-based care (under the supervision of not-for-profit centers).

Using data from the six available cycles of Statistics Canada's National Longitudinal Survey of Children and Youth (NLSCY), this paper answers the following questions: Has the policy improved children's school readiness in Québec? Has the policy diminished "social" gaps (e.g. between children with a low-education mother and those with a high-education mother) in school readiness? How does half-day pre/kindergarten in a public school setting (the policy chosen by the Province of Ontario for 4- and 5-year-olds) compare with Québec's childcare policy?

A non-experimental evaluation framework based on multiple pre- and post-treatment periods is used to estimate the policy effects. Québec's preschool children (the treatment group) are compared with children of similar ages in the Rest of Canada (or in Ontario), the control or comparison group, over several years. The estimation technique used to measure the impact of Québec's childcare policy is a difference-in-differences approach.

Only one other paper (Baker et al., 2005, 2008) has examined the impact of the policy on cognitive test scores of the 4-year-olds (only) measured by the Peabody Picture Vocabulary Test

(PPVT) with 4 waves of the NLSCY and found no effects of the policy. For the PPVT scores, Baker at al. disregard those of the 5-year olds to separate greater non-parental care from exposition to kindergarten. But most Ontario's 4 years are enrolled in junior kindergarten. Moreover, all 5-year-olds Canadian are exposed to kindergarten and, depending on the province, for a full-day or a part-day. For several reasons, we believe it is worthwhile to pursue the line of research initiated by Baker et al. on the effects of the policy on cognitive outcomes.

First, we exploit the more recent data in wave 6 of the NLSCY and a different approach to measure cognitive achievement using a standardization procedure for the PPVT score suggested by Statistics Canada, better suited to capture changes in scores across time. In the User Guide of wave 4 of the NLSCY, researchers are warned that the PPVT standardized scores available in the NLSCY data sets cannot be compared over time because the standardization procedure used for cycles 4 to 6 was not the same as in cycles 1 to 3.

Second, although most 5-year-olds are not in childcare, they remain affected by the policy at younger ages and are clearly "treated" by the policy if only by the introduction of free full-time kindergarten starting in September of 1997.

Third, Baker et al. work with a sample of children living in 'dual-parent' families while excluding children with single-mothers and use only four of the five cycles that were available from the survey (skipping the third one considered as an implementation period). We include children from single-parent households in the sample and use data from all the 6 cycles. And, we also conduct the analysis for sub-samples by the level of education of the mothers.

Fourth, because the policy was implemented incrementally, the number of families touched by the policy, as will be made clearer later in the paper, increases considerably from cycle to cycle. Hence, cycle 6 includes the largest number of children possibly "treated" by the policy.

Finally, in contrast to Baker et al. we estimate the model using the bootstrap weights developed by Statistics Canada for linear regression analysis and complex sampling schemes.

Our results reveal substantial negative effects of the policy on cognitive development for both 4- and 5-year-olds. For 4-year-olds, we find that the policy decreased PPVT scores of children in cycle 6 by, on average, approximately one fifth of a standard deviation; for 5-year-olds, the decrease is by more than one fourth of a standard deviation. These impacts are very large relative to other variables. They are approximately equal to the impact of a mother with a university diploma rather than a high-school diploma. Furthermore, the results for two sub-samples of children based on the mother's education (mothers with a high school education or less, and mothers with a university degree) suggest that the policy did not reduce "social" gaps in school readiness and that the policy effects are sensitive to the mother's education level.

We must point out that this paper is not about the evaluation of the effects of childcare on the development of children but is an evaluation of the effects of a low-fee-for-long-hours-in-day-care policy on cognitive development. Non-experimental studies that attempt to estimate the effects of childcare on outcomes are plagued by problems of identification and spurious correlation. First, because most children who are in daycare have working mothers, regression methods have difficulty disentangling the effects of non-parental daycare relative to parental daycare from the effects of a working mother relative to a mother staying at home. Second, because using childcare is a choice, it is a function of unobservable preferences that can also determine the cognitive performance of children. For example, mothers who stay home may in general love spending long hours with their child which could be beneficial to the child. On the other hand, some mothers with very low levels of human capital do not work and do not use childcare and it is well-known that on average, children with low-education mothers score poorly

6

on cognitive tests. Panel data can alleviate the bias due to spurious correlation but the identification problems remain.

We surmise that our evaluation is immune to these problems because the policy was unexpected and can therefore be considered exogenous with respect to any unobserved variables affecting cognitive outcomes (the program finally adopted implementation date and age requirements a few months before implementation). Also, had the policy been merely a reaction to strong growth of female labor supply, there would be a potential endogeneity problem, regression analyses confounding the effects of the policy with unobserved factors driving the growth in labor supply. However, Lefebvre and Merrigan (2008) show this is not the case.

Our results, with all their limitations, should be of concern to all policy makers who seek to "universalize" the provision of early childhood care. We provide later in the paper some tentative hypotheses (based on the quality of care in Québec and the results in this paper on the effects of the policy on hours in daycare) concerning the mechanisms that are possibly driving the negative effects of the policy.

It is well known from experimental studies such as the Perry Preschool Project that ECEC programs that target severely disadvantaged children have strong positive effects on these children. Unfortunately, we cannot evaluate the effect of the Québec policy on very disadvantaged children for two reasons. First, the program is targeted towards working mothers so that very few children with mothers having a low attachment to labor force (with low skills or on welfare) are in subsidized daycare. Second, samples of such children with mothers on welfare in Québec are very small in the NLSCY.

The rest of the paper proceeds as follows: Section 2 reviews prior research evidence on ECEC and child development. Section 3 presents public policy pertaining to ECEC across Canada and traces the unique evolution of Québec in this regard. Section 4 identifies the conceptual issues

and lays the framework for the econometric analysis. Section 5 describes the data set used to perform the analysis and presents descriptive statistics. Section 6 contains the empirical results and a discussion. Section 7 concludes with a summary and policy implications.

2. A summary of recent research results on ECEC and child development

There are several observational studies on the effects of maternal employment or early childcare and education on child development (cognitive, behavioral, socio-emotional, and health related). Given our approach, we focus on those using large data sets with a large set of control variables in regression analyses.

First, for studies on <u>early childcare and maternal employment of children aged 0 to 2</u>, there is a growing body of empirical results indicating that maternal employment and time spent in childcare during the first year of life can have adverse effects on a child's developmental outcomes (such as verbal, reading and math scores, and indexes of behavioral problems) observed at a later ages (Ruhm, 2004; Waldfogel et al., 2002; Hill et al. 2005). In some articles, early full-time employment is found to be harmful, even after controlling for childcare quality, the quality of the home environment, and maternal sensitivity (Brooks-Gunn et al., 2002; Hill et al., 2002; and for United Kingdom, Gregg et al. 2005).

Second, several studies (Gormley and Gayer, 2005; Gormley et al., 2005; Magnuson et al., 2004, 2005) estimate the effect of <u>preschool programs</u> on outcomes prior to or at kindergarten entry or later <u>for children aged 3 to 5</u> and find statistically significant positive effects on cognitive outcomes (letter-word identification, spelling and applied problems) and measures of school readiness. Longer hours in all types of preschool are associated with more behavioral problems that persist over time. Nonetheless, the cognitive gains for disadvantaged children (whether defined by poverty status, low maternal education, single parent headship, or mothers who do not

8

speak English) are larger and longer lasting. A large-scale UK study following children aged 2 or more who attend center-based preschool shows similar results (Sammons et al., 2002, 2003).

Third, there appears to be an "optimal" minimum age "requirement" before one's child is placed in care (O'Brien Caughy et al., 1994; Loeb et al., 2005). The aforementioned studies suggest that this minimum age "requirement" varies between one and two years of age and that long hour children spend in daycare will matter for future outcomes. For disadvantaged children (ages 2-3), 30 hours per week of care for at least 9 months per year (more intensive care) has little detrimental effects on their behavior, while producing positive effects on their cognitive outcomes. In contrast, the cognitive development of children from wealthier households appears to benefit from daycare outside the home only if it is part-time (between 15 to 30 hours per week for at least 9 months per year).

Fourth, the quality and effectiveness of care (sensitivity and affective quality of caregiver-child interactions) seems to have positive, but small, effects on cognitive outcomes (Blau, 1999; Duncan, 2003). Of particular interest is Duncan's remark that when effects of daycare are negative they are more pronounced for children who spent all their day time in center-based care, versus none, during their third and fourth years of life. Moreover, center-based care is not found to have any significant impact on cognitive outcomes if it was initiated during the early stages of childhood. Finally, this study suggests that children with low initial cognitive skills may benefit most from quality care. Using the same data set as Duncan, Belsky et al. (2007) show that children, whose hours spent in childcare increased between 3 and 54 months of age, scored significantly lower on a vocabulary test in fifth grade. It is the first study with NICHD data that detects such long-term links between experiences in childcare and achievement in school. The authors summarize prior NICHD published work showing that, before the transition to school (at age 4 1/2), higher quality childcare was associated with higher levels of pre-academic skills and

language scores, whereas more hours in care and increasing hours in care were associated with higher levels of behavior problems, but not academic skills or language functioning.

There are few Canadian studies on the same topic. Using cycle 1 (1994-1995) of the NLSCY, Lefebvre and Merrigan (2002) show that non-parental care (center- or family-based), compared to parental care, has no effect on the cognitive development of children, as measured by an index of their social and motor development (for children aged less than 48 months) or by PPVT scores (4- and 5-year-olds). The estimates show that some observable family characteristics such as the mother's education and immigration status have very strong effects on a child's score.

Using cycles 1 and 2 (1994-1995 and 1996-1997) and cycles 4 and 5 (2000-2001 and 2002-2003) of the NLSCY, Baker et al. (2005, 2008) analyze the impact of Québec's childcare policy on childcare use, hours in daycare, maternal work, and diverse behavioral measures of the "well-being" of both children (0 to 4-year-olds) and parents, and the PPVT scores of the 4-year-olds in the sample. Their estimation approach is a DD method proposed by Bertrand et al. (2004). Most of the analysis highlights the fact that Québec's childcare policy is estimated to have deleterious effects on both the behavioral scores and health indicators of Québec's children, such as 2-3 year-olds' hyperactivity, 2-3 year-olds' emotional disorder, 2-4 year-olds' pooled separation/anxiety, aggressiveness; 0-2 year-olds' ear and throat infections.[1] Baker et al. suggest these effects may be temporary. They also find, as mentioned in the introduction, that the policy had no effect on the 4-year-olds' PPVT scores.

It should be re-emphasized that the analysis of the impact of the policy on the PPVT scores of 5-year-olds is as justified as for 4-year-olds. The extent of vocabulary a child possesses is

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[1] Theses are rather not surprising outcomes taking into account the very large increases in childcare enrolment as observed in Québec (see hours in childcare by age below). It is a fact of life that a child in childcare will experience such benign illness. Moreover, very few children less than 1 year are in childcare because most working mothers are eligible for the 50 weeks (25 weeks before 2000) paid parental leaves program, part of the federal unemployment insurance regime.

undoubtedly richer as he ages. Secondly, Québec's 5-year-olds have potentially been exposed to more years of childcare after the policy was implemented than 4-year-olds, whereas 4-year-olds are still in the "process" of being cared for. Thus, the 5-year-olds give us a more precise picture of the (cumulative) effects of the policy which may affect children. Finally, the NLSCY sample of 5-year-olds who took the PPVT test is almost twice as large as the one for 4-year-olds.

3. Early childhood care and education in Québec and across Canada

Table 1 presents the evolution of the number of spaces partly or totally subsidized by the government from 1993-1994 to 2006-2007 by type of childcare setting as well as the total number of Québec's children in different age groups by year. The implementation of Québec's childcare policy began on September 1 1997 when licensed and regulated childcare facilities (not-for-profit centers, family-based daycare and for-profit daycare centers) under agreement with Québec's Department of the Family started offering spaces at the reduced fee of $5 per day per child, for children aged 4 on September 30. On September 1 1998 and on September 1 1999 respectively, the 3-and 2-year-olds (on September 30) became eligible for the low-fee spaces. On September 1 2000, eligibility for low-fee daycare is afforded to all children less than 5-years-old (not eligible for kindergarten because the birth-month requirement to be enrolled is September 30). For children aged 5 on September 30 1997, full-day instead of part-day kindergarten was offered by all School Boards (some private schools already offered this option). Kindergarten is not compulsory but if a child is enrolled in a public school, he or she must attend class for the full school day and school week. The yearly increases from 1998 are all quite substantial. Since the introduction of the policy, it is well known that the program has not been able to satisfy all of the increased demand for low-fee spaces. Moreover, the price of daycare for families who do benefit from a subsidized space, that usually offers 11 to 12 hours of daycare per day, 5 days per week, is not only low but also independent of the mother's labor status, hours of labor supply and family

income. Since the introduction of the policy, it is well known that the program has not been able to satisfy all of the increased demand for low-fee spaces (spaces are allocated on a first-come first-served basis on the waiting list of the providers). It is difficult to obtain data on the number of children on waiting lists with no access to a subsidized space.

Table 2 shows the budgetary credits for the childcare program by setting as well its transformation from a parent fee-subsidy program to a childcare provider subsidies program. Since January 1 2004, the fee per day has been fixed at $7 instead of $5 (after the raise, roughly 85% of total costs were covered by the government subsidy). Nonetheless, the subsidy per space continued to soar because childcare educators obtained much better working conditions. In 1996-1997, the subsidies, which partially covered costs, were directed to licensed and regulated childcare facilities, while low-income families received a fee subsidy according to eligibility criteria, amounted to 288 million dollars. In 2006-2007, subsidies had reached 1.6 billion dollars, practically all directed towards daycare providers.

We cannot trace such an elaborate picture of the evolution of childcare services for other provinces in Canada, but we know the number of children in subsidized-fee daycare is very small relative to Québec and has remained small during the period of analysis (Doherty et al., 2003; Friendly et al., 2007). It is also difficult to obtain a larger picture of daycare utilization, arrangements, and reasons for the use of daycare across Canada. The last national survey on childcare use was conducted in 1988. Other than licensed centers and family-based regulated daycare, parents can choose unregulated daycare in their own home or in someone else's home by a relative or by a non-relative. Provincial and federal policies provide tax relief for childcare spending as long as receipts are presented to income tax authorities.

Policy in provinces other than Québec remained largely unchanged during the nineties (although fee subsidy eligibility levels and rates have been raised modestly in some provinces)

12

and the number of children in subsidized daycare remains very low. The constancy of the subsidy policy in the rest of Canada is fundamental, given our estimation methodology and the sample period we consider for our regression analysis. All provinces offer publicly provided free kindergarten for 5-year-olds in a school setting under the auspices of the Department of Education. All programs are for a half-day (2 hours and 30 minutes) during the school year, except in Québec (which is for a full day, since the fall of 1997), New-Brunswick and Nova-Scotia. In most provinces parents are free to register their child in kindergarten as it is not a legal requirement (a large majority of eligible children do attend kindergarten). In Ontario, most School Boards offer a half-day of junior kindergarten for 4-year-olds. Since the fall of 1997, almost all 5-year-olds in Québec attend full-time kindergarten (according to administrative data, kindergarten attendance increased from 88% half-time before 1997, to 98% full-time afterwards) while a large number attend before- after-school subsidized daycare settings. We therefore consider that the only major change in kindergarten policy for 5-year-olds from 1994-1995 to 2004-2005 occurred in Québec. Furthermore, the fact that in Ontario most 4-and 5-year-olds are enrolled in (pre)kindergarten suggests that this province offers an interesting control group as an alternative to the nine provinces.

Although the NLSCY survey is not as detailed as a childcare survey, it still provides key information on childcare use. The NLSCY asks the person most knowledgeable about the child (PMK) if childcare services are used for the purpose of studying or work and for each mode of childcare used, the number of hours per week. Figure 1 presents graphs, for Québec and the other provinces, of the principal care (mutually exclusive) arrangement used by parents for children aged 0 to 5 for the 6 cycles of the NLSCY. From the third cycle of the survey (1998-1999), it appears that a larger percentage of children in Québec are in daycare relatively to other provinces. Family-based daycare outside of the child's own home is the most widely used mode

of daycare across Canada. Daycare is growing rapidly in Québec relatively to other provinces since 1998. Daycare in the household (by relatives or non-relatives) is slightly higher outside of Québec. Center-based care, including before- and after-school care increases rapidly in Québec compared to the other provinces where this arrangement ranks third.[2] Figure 2 graphs the mean hours children spend in the primary care arrangement by age of children from Québec (Q) and the other provinces (C). From the third cycle of the survey on, there is a large increase in the average hours (0 hours are attributed to the child if not in childcare) children less than 1 to 4 years old spend in daycare for each age group in Québec compared to the other provinces. The decrease of hours in care for children aged less than 1, observed for Québec and the other provinces between cycles 5 and 6, is most likely due to the extension of the paid parental leave program from 25 weeks to 50 weeks after 2000 (see below the econometric results on hours of childcare), and which is part of the federal unemployment insurance regime.[3] The 5 year-olds, as expected, spend less time in childcare than 4 year-olds and the rise of hours in daycare is smaller for the former than for younger children. The slight increase is explained by the $5 per day before- and after-school daycare policy introduced in 1998.

Table 3 presents the breakdown of children benefiting from the low-fee childcare policy in Québec by age and setting in years 2000 and 2004, and shows the number of children that have been exposed to childcare services over the years (unfortunately, these administrative data are not publicly available for the years before 2000). The last three columns of Table 3 indicate a notable regression of entry age in childcare and a large progression of the proportion of children having experienced childcare by age four. In 2000, 34% of all children aged 0 to 4 were in low-fee

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[2] Lack of inclusion of full-day kindergarten as a mode of care probably distorts the changes here, particularly in the Province of Ontario where most 5-year-olds and eligible 4-year-olds attend junior-kindergarten.
[3] In fact, they are very few young babies in childcare. Most mothers, entitled for parental leave paid by the national unemployment insurance program, who returned to work, did so after 8 to 12 months after the ends of their pregnancy. Thus, most returning to work mothers do so before the child's first birthday.

childcare services, 45% in 2003 (statistic not shown) and 49% in 2004. To summarize, the tables presented so far show important shifts in daycare use, modes, and intensity occurring in Québec after the introduction of the daycare policy in 1997 but not in the other provinces.

4. Conceptual issues and econometric modeling

Lefebvre and Merrigan (2008) as well as Baker et al. (2005, 2008) have shown the program has a strong impact on the labor supply of mothers with preschool children. However, using the Canadian Survey of Labour and Income Dynamics (SLID), Lefebvre and Merrigan show that the program has a moderate impact mothers' earnings and indirectly on net family income as the additional earnings from the mother's increased labor supply were taxed and transfers geared to families (some of which in Québec and Canada depend on total family income) reduced. Such moderate gains should have a very small positive impact on child development. If this is the case, the treatment effect estimated in this paper is mainly capturing the effect of an increase in female labor supply which is basically the effect of substituting hours with the mother with hours in daycare. It is also capturing the effect of a change in type of daycare setting, children mostly moving from more informal daycare in the child's home or in a non-related person's home to formal full-time[4] regulated daycare.

Given these considerations, we conclude that we cannot a priori expect positive or negative effects of the policy. On the one hand ECEC interventions are shown to have positive effects on children; on the other hand spending long hours in daycare can have negative effects. Furthermore, it has been shown that an increase of the mothers' labor supply when the child is at a young age may also have negative effects in the future.

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[4] Almost all the subsidized spaces in the childcare network (85% according to administrative data) are offered (and must be occupied) on a full-time basis (for a maximum of 20 days per four weeks and no more than 260 days per year). A family must pay monthly ($1,305 on a yearly basis) to maintain its access to a space, even if the child is absent from the childcare service (due to sickness or for family vacations).

It is very difficult here to pinpoint who are the "treated" by this policy in a precise sense. One might assume that children who would not have been in daycare in the counterfactual world of no low-fee childcare and who are now in daycare are the treated. But we must also count those who would have been in a different setting in the counterfactual world. In some sense, even children who would be in the same setting without the policy are "treated" because daycare facilities now have more children and are more diverse than before. Children in daycare are mostly spending longer hours in daycare and children who stay home could have fewer friends at home because most are in daycare. Hence, all children are touched by this policy, albeit in different ways. Therefore, we do not attempt to estimate the treatment on the treated effect but only the average treatment effect for children of ages 4 and 5 in Québec.

Our econometric approach is based on a difference in differences (DD) procedure which is now well established to evaluate natural experiments (Angrist et Krueger, 1999). We observe 4 and 5-year-olds in Québec, where the policy is implemented, before and after the policy change. Our comparison groups will be children of the same ages in the Rest of Canada (RofC), and a group consisting of children strictly from Ontario, a subset of the first comparison group, where, in both cases, no important changes occurred during the same time period.

To estimate the model, we turn to a DD specification, differentiated by period, presented by Francesconi and Van der Klaauw (2007):

$$Y_{it} = \alpha + \theta Q_{it} + \gamma * I(t \geq s) + \beta_4 D_{i4} Q_{i4} + \beta_5 D_{i5} Q_{i5} + \beta_6 D_{i6} Q_{i6} + \Phi X_{it} + \varepsilon_{it}$$

(1)

Where i indexes children, Y_{it} represents the outcome, in our case the child PPVT score. ε_{it} is an error term. X_{it} is a vector of socioeconomic control variables and Φ is a vector of parameters. Q_{it} takes the value of 1 if the child lives in Québec, 0 otherwise. $I()$ is an indicator function, γ

represents the effect of a post-policy aggregate (common to both regions) change in the intercept, and s is the period the policy is "implemented". D_4, D_5, and D_6 are dummy variables taking the value 1 if the observation is from cycle j and 0 otherwise, j=4, 5, 6. Naturally, if ($\beta_4=\beta_5=\beta_6$) one obtains a standard DD estimator. In our case, we consider post-policy periods start in 2000-2001, cycle 4, when the total number of new spaces created since the beginning of the policy is substantial (56,000). It is important to include a specification where the effects of the policy vary for each post-policy cycle in order to test the hypothesis that each cohort of children was treated differently. Bear in mind that between each time period, from cycle 4 to cycle 6 (2004-2005) more than 30,000 new spaces were created. Furthermore, the total number of hours spent in care varies quite importantly with each cohort, as can be seen in Figure 2. These remarks justify equation (1), where β_j, for j=4, 5, 6, represents a time or cycle-specific effect of the policy.

To test the sensitivity of the results to different specifications, we estimate three models. The first is a DD specification without any socioeconomic controls[5] (i.e. without any of the variables contained in X_{it}) and the effect of the policy is constrained to be the same for all the post-policy years, so that:

$$Y_{it} = \alpha + \theta Q_{it} + \gamma * I(t \geq s) + \beta\, I(t \geq s)\, Q_{it} + \Phi X_{it} + \varepsilon_{it} \qquad (1A)$$

In this case, the effect of the policy is captured by the parameter β. It is an average treatment effect for cycles 4, 5 and 6 combined.

The second and third are DD specifications, based on (1), where the policy effects are respectively constrained to be the same and unconstrained for each period, with socioeconomic controls. They include the sex of the child, the age group of the mothers at child birth (25-29, 30-34, 35 or more with 14-24 the omitted group), family type (two-parent, step family with single

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[5] All the controls presented in the table of descriptive statistics are excluded except: the policy variables which appear in the regression table; a dummy for the province of Québec; dummy variables for English speaking children in Québec and French speaking children in the Rest of Canada; and a constant.

parent the omitted group), whether the mother is born in Canada or not, the mother's highest level of education (high school diploma, some postsecondary education, university diploma with less than high school diploma the omitted group), the presence of older or younger siblings or child of the same age, size of community (five groups from 500,000 or more to rural the omitted group), and family income in 2001 dollars. The estimations are also conducted with strictly Ontarian children as an alternative control group. As one of the policy's goals is the equality of opportunity for children, we estimate the models for two sub-groups based on mothers' level of education in order to check whether the policy diminished "social" gaps (between children whose mother has a high school education or less and those whose mother has a university degree) in school readiness. All estimations were performed with "bootstrap weights" as computed by Statistics Canada for the NLSCY, which take into account the complex survey scheme.

5. Data set

The data used for our empirical analysis are provided by Statistics Canada's National Longitudinal Survey of Children and Youth (NLSCY) which is a probability survey designed to provide information about children and youth in Canada. The survey covers a comprehensive range of topics including childcare, information on children's physical development, learning and behavior as well as data on their social environment (family, friends, schools and communities). The NLSCY began in 1994-1995 and data collection occurs biennially. The unit of analysis for the NLSCY is the child or youth. Supplementary Table A1 presents some particularities of the NLSCY that must be emphasized to understand the type of analysis that can be undertaken.

The PPVT was designed to measure receptive or hearing vocabulary. For the NLSCY, it was used to measure school readiness for children in the 4- and 5- year-old age groups. The master files present both the PPVT raw (PPVT-Raw) and the PPVT standardized (PPVR-SD) scores.

However, Statistics Canada has used different methodologies to standardize the scores.[6] The released measurements for cycles 1 to 3 were standardized within cycle (with slight variations in the methodology), while cycles 4, 5 and 6 were standardized over the grand population of all tests over the first 5 cycles of data. Cycles 1 to 3 would in essence look similar from one time to the next as they are standardized by age groups to have the same mean of 100 and standard deviation of 15. This type of standardization is common for analysis of domains within a cycle; however it provides limited insight for in-between cycle analysis. Realizing this limitation, Statistics Canada introduced in Cycle 5 a less restrictive normalization technique where the expected age performance is benchmarked against all children of that age over time versus those measured at the same time. The scores are still adjusted by age group to have a mean of 100 and a standard deviation of 15 but computed over 5 cycles, and they are less susceptible to sampling variation as 5 samples have been used to determine the norm. For robustness and to facilitate analysis of changes through time (to capture true population differences over time and not simply differences resulting from sampling error), we have re-standardized (using Statistics Canada smoothing routine) the PPVT-Raw scores using all the 6 cycles in the NLSCY. It should be noted that the standardization was done separately for the PPVT and the EVIP (the acronym for the French adaptation of the test). This should be of no concern as our estimates are based on differences in changes of scores over time between the children of Québec, more than 80% French speaking, and those from the rest of Canada or Ontario. We also perform regression analysis with PPVT-Raw scores, in this case controlling for children taking the test in French (English) in the other provinces (Québec). Only children who understood English or French well enough to follow instructions were given the test.

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[6] The score is adjusted for the age (the smoothing technique is applied by 2-month age groups) and the language in which the children passed the test (English or French).

We sampled all children aged 4 and 5 from the data sets of all 6 cycles. Children living in foster families are excluded as well as those (very few) with a mother with missing information on the socioeconomic control variables (see supplementary Tables A2 and A3). Children with a missing PPVT score are also excluded. Secondly, we constructed two sub-samples by the level of education of the mothers: low-education (with a high school diploma or less) and high-education (with a university degree or more). Supplementary Table A4 for Québec and Table A5 for the Rest of Canada present the mean values of variables used in the regressions. These statistics show that mothers in both regions are very similar except for education in Québec in cycle 2, where better educated mothers are over-sampled, and immigration status (there are less immigrant mothers in Québec) for all cycles.

A descriptive analysis

Figure 3 contains graphs tracing the time-series evolution of the mean PPVT-SD scores for children aged 4 and 5 in Québec, Ontario and the other provinces (including Ontario), and by the education level of the mother. A rough calculation of the program effects using the PPVT-SD means of children in Québec and in the Rest of Canada (RofC) yields estimates that are very close to those found in the estimations. For 4-year-olds, the mean score gradually decreases in Québec while it increases in the RofC, with a sharper decline in Québec than in the RofC for the last cycle (2004-2005). As for the 5-year-olds, we see a strong positive trend for the RofC and a very slight decreasing trend in Québec. For the PPVT-SD, a simple DD estimate using the first and last cycles of data gives a treatment effect of -2.41 for 4-year-olds and of -4.34 for 5-year-olds. Scores for Ontarian 4-year-olds children are more erratic which may reflect the smaller sample.[7] The scores by education level of mothers show the same patterns of gradual decreases in

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[7] In all cycles, Ontario has the lowest response rate. For all Canada, the response rate over all cycles is approximately 90% and for Québec approximately 92%.

Québec and increases in the RofC, with a large gap between low-education and high-education mothers in both samples.

6. Estimation results

We start by providing evidence on the effect of the program on hours in daycare for children of different age groups. The program could have different effects on hours in daycare for different cohorts because of the gradual way it was implemented. In order to evaluate this program effect, we estimated a DD model as in equation (1) with different policy effects for different cycles. However, to demonstrate the small impact of the program in the early stages we add a dummy for cycle 3 (years 1998-1999). The estimated equation becomes:

$$Y_{it} = \alpha + \theta Q_{it} + \gamma * I(t \geq s) + \beta_3 D_3 Q_{i3} + \beta_4 D_4 Q_{i4} + \beta_5 D_5 Q_{i5} + \beta_6 D_6 Q_{i6} + \Phi X_{it} + \varepsilon_{it} \qquad (2)$$

Table 4 displays the policy effects by age group (0 to 4) and mothers' level of education for cycles 3, 4, 5 and 6. For children under 1 and for cycles 4 and 5, the effect of the subsidized daycare program is to raise hours in daycare by respectively, 6.02 and 7.46 hours, in both cases significant ($p<.01$). The not significant effect for cycle 6 reflects the increasing number of families using the paid 50 weeks maternity-parental leave federal program. For ages 1, 2, 3 and 4, the effects increase substantially between cycles 3 and 6, reaching 10.46, 11.65, 9.46, and 8.95 hours respectively. It is important to note that cycle 4 effects are all smaller than cycle 5 and 6 effects as new spaces were created every year during that time period. It is quite clear then that the cycle 6 children were exposed to the longest hours in daycare considering the time since birth. The two other panels of Table 4 demonstrate that the "cumulative" effect is substantially larger for women in the higher education group. Clearly, the last two cohorts of our data set (cycles 5 and 6) were more intensely affected by the program than the earlier cohorts. We now turn to the effects of the daycare policy on PPVT scores.

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We first discuss the results of the policy on cognitive development for 5-year-olds. The estimates of equation (1A), with standardized scores, no covariates, and with the full sample of children by Ordinary Least Squares are found in Table 5, column 1, line 1. We find a negative effect of the policy with a parameter estimate that is -4.28 (p<.01). This is a very large effect (almost one third of a standard deviation of the dependent variable). As a comparison, the ceteris paribus "effect" of a mother moving from a high school degree to a university degree is approximately 3. Results with covariates are very similar to the results with the standardized scores and no covariates (Table 5, lines 2 and 3). For the 5-year-olds, the DD model with covariates provides us with estimates of -3.78 (p<.01) for the standardized scores and -4.93 (p<.01) for the raw scores. The negative effects are observed for both high- and low-education mothers (lines 4 and 5, column 1), but are slightly higher for the sample of children with mothers low-education. For the latter, the effect is -3.78 (p<.05), for children with high education mothers, it is -3.05 (p<.01). Results for the specification with the policy effect changing through time (equation (1)) and the full sample (Table 5, columns 2 to 4, line 2), show the effects to be quite similar across periods. However, they considerably raise for children with low education mothers moving from -2.32 (not significant) to -5.18 (p<.05). The differences between the period effects are not statistically significant (H0). The specification with only Ontario (Table 5, line 6) as the control group gives almost the same results as with all nine provinces.

Turning to 4-year-olds, the results for equation (1A) (Table 5, column 1, lines 7 and 8), show a very small and significant effect of -2.36 (p<.10)) with no covariates and a smaller effect of -1.29 with covariates. The results are also not significant for children whose mothers' has a university degree (Table 5, line 11). On the contrary, the results for the low-education group show a large and negative effect of -3.83 (Table 5, column 1, line 10), but barely significant

(p<.10). Using 4-year-old Ontarians as a control group does not alter the test results, even if it does alter the sign and/or size of the effects (Table 5, line 12).

Results for the specification with the policy effect changing through time and the sample of Canadian children (Table 5, columns 2 to 4, line 8), show a pattern of increasing negative effects across periods, with differences between the period effects that are not statistically significant (H0). When statistical significance is observed it is at 90% level of confidence except for children with mothers with a lower level of education in cycle 6 (Table 5 column 4 line 10), where the negative effect is found to be the largest (-7.20, almost one half of a standard deviation) and significant at a 99% level of confidence, a disturbing result.

Discussion

In summary, the effects of the program are found to be negative for 5-year-olds and less convincingly negative for 4-year-olds. The results for sub-samples of children (mothers' level of education) suggest that the policy did not reduce "social" gaps in school readiness. In fact, the estimates show the negative estimated impacts of the policy are larger for children with a less educated mother.

We propose three major explanations for our results when compared to former studies on the impact of ECEC on preschool cognitive achievement. First, most studies that attempt to evaluate the impact of additional daycare are plagued by endogeneity or spurious correlation problems which is not the case in our study.

Second, rarely can we observe variations in hours of care for young children of the magnitude observed after the implementation of the program. For example, in 1994, 45% of all children aged 1 to 4 were in childcare and 32% for more than 21 hours per week, in 2002, 70% of children of the same age are in childcare and 54% for more than 21 hours. Not only are more children in daycare but they are there for much longer hours.

Third, although more children are now in regulated types of daycare, which is supposed to be helpful or at a minimum not harmful, two major studies (ISQ, 2004; Japel et al., 2005) show that the average quality in Québec's subsidized daycare network is at best satisfactory and in many cases low or not acceptable, particularly for children in lower income families. Supplementary Table A4 summarizes the results of the 2004 study on educational quality by characteristics of daycare and overall quality: family-based, for-profit-center and childcare for infant services are of rather fair quality and, except for non-profit centers, childcare services are largely unsatisfactory or fair in terms of overall quality. Part of this is explained by the rush to implement the program, build up new settings and create new spaces to respond to the excess demand for spaces, which forced the government to accept daycare workers with no specific training in ECEC.[8]

It would therefore be recommended to any state intending to follow Québec's footsteps to be weary of offering long hours to parents at very low prices. Since it is important to offer high-quality daycare services, it would be advised to implement slowly such programs, starting in low-income neighbourhoods, where experimental studies have proven their efficacy when providing high quality services. This would also give some time to the proper educational facilities to start offering programs that better prepare workers for the daycare industry.

Finally, it is interesting to compute the evolution of costs of Québec's childcare policy relatively to the province's GDP (in current Canadian $): they increased from 0.16 percentage points in 1996 to 0.57 percentage points in 2006. Thus the policy's costs, in terms of GDP, have

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[8] According to administrative data from the Department of Family, in 2001: 42% of not-for-profit centers do not respect the ratio of two out of three 'qualified' educators; 25% of for-profit centers do not respect the very less stringent ratio of 1/3; overall, 40% of educators have no specific qualification in ECEC. A person is considered as having qualification if she has a university diploma (17%; generally they are directors of centers) or training in ECEC at the university level (6%), a post-secondary "non-university" degree (37%), or a secondary school diploma or vocational training in ECEC (40%). Family-based educators have less formal qualification: 45% have a high-school diploma or less, 84% have no specific training in ECEC; and only an average of 7.7 years of experience in childcare occupations.

more than tripled in less than ten years. Abstracting from the construction costs of new childcare spaces, which have dropped dramatically since the number of newly created spaces cycle-by-cycle has substantially receded (from a peak of +42% between 1998-1999 and 2000-2001 to +16% between 2002-2003 and 2004-2005), the main source of rising costs undoubtedly comes from the salaries paid to the children's educators and to the rest of the staff running the regulated childcare facilities.

7. Conclusions

We present evidence that the subsidized daycare policy of the province of Québec has produced negative effects on the PPVT scores of children aged 5 and possibly negative for children of age 4, in particular those with less educated mothers. Therefore, if the policy increased substantially the labor supply of mother's with young children, one of the policy goals, there is no evidence, up to now, that it has enhanced school readiness or child-well being in general, the other major goals of the policy. Our intuition for this result is that children are simply spending too much time, especially when they are less than 3, in daycare for the policy to have any positive effect. This is explained by the structure of the program which creates strong incentives for families to use long hours of daycare for children at a very young age and for all other pre-K ages. For example, the daily fee ($5 per day per child from September 1997 to 2004, and $7 since January 2004) is the same for all age groups despite the fact that daycare costs are much higher for the very young.[9] Services are available 10 to 12 hours (depending on the setting) per day, 260 days a year. The government asks daycare providers to make sure parents use daycare services every day of the week (unless the child is sick): if a space is not occupied full-time the subsidy is reduced. In other words, even if a family would like to pay for a full week

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[9]The public subsidy provided to not-for-profit centers providers for a child aged less than 18 months is now approximately $65 per day and $50 per day for a child aged from 18 to 59 months.

despite wanting the service part-time, a child cannot be enrolled for only three days or five half-days per week. Furthermore providers themselves prefer to offer full-time full-week spaces because it is easier to manage.

Of course, we have looked at only one measure of development. However, it has been shown to be a consistently good forecaster of schooling achievement in numerous studies. Unfortunately, the birth cohorts of cycles 4, 5 and 6 will not be followed in future cycles of the NLSCY as many will be exposed to substantial hours in daycare starting mostly from their first birthday. The data will not permit thorough analysis on the long-term impacts of the policy as only one longitudinal cohort followed after children are older than 5 (4-year-olds in cycle 3) was subjected to the treatment and it lasted only one year.

We conclude by emphasizing that we are estimating the effects of a particular complex daycare policy on the cognitive development of children who are 4 and 5 and not the effects of childcare per se. Therefore, there is no inconsistency with other type of studies that find positive effects of childcare on developmental outcomes. However, this policy, because of its structure, substantially increased hours spent in daycare settings evaluated to be of medium or low quality on average. We surmise that these factors could explain the negative effects found by our regression analyses. Moreover, Belsky et al. (2007) have shown that an important increase in hours spent by children in care has long-term negative effects on their vocabulary test scores. Thus, our results can "bridge" the gap between the short- and long-term.

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Table 1: Number of childcare regulated spaces and subsidized[1] spaces for preschool children on March 31st by setting and number of children aged less than one year, 0 to 4 years and 5 years on July 1st, Québec, 1994-2007

Year	Spaces in not-for-profit network[1]		Spaces in for-profit center[2] under agreement (not subsidized)[3]	Total number of spaces at a reduced fee[4]	Total number of children [less than 1 year], 0-4 years and (5 years)
	Center	Family-based			
1993-1994	33,452	15,253	(15,665)	64,370	[90,417] 480,098 (90,603)
1994-1995	34,545	17,871	(18,366)	70,782	[87,258] 473,113 (96,973)
1995-1996	36,708	19,479	(19,842)	76,029	[85,130] 460,657 (99,415)
1996-1997	36,101	20,328	17,629 (4,806)	74,058	[79,724] 445,143 (98,853)
1997-1998	36,977	21,761	17,979 (5,587)	76,715[5]	[75,674] 428,297 (94,674)
1998-1999	39,436	32,816	23,861 (585)	96,113[5]	[73,599] 412,161 (91,453)
1999-2000	45,793	44,882	23,270 (1,208)	113,545[5]	[72,070] 397,971 (89,358)
2000-2001	51,988	55,979	24,578 (705)	132,545	[73,699] 381,522 (87,111)
2001-2002	58,525	62,193	24,629 (976)	145,624	[72,200] 373,264 (83,582)
2002-2003	63,339	75,355	24,740 (1,620)	163,434	[73,600] 368,920 (79,015)
2003-2004	68,274	82,044	27,530 (1,907)	177,848	[74,370] 371,028 (76,105)
2004-2005	72,057	87,192	30,131 (2,457)	189,380	[75,206] 373,406 (76,130)
2005-2006	74,573	89,011	33,034 (3,487)	196,618	[78,352] 379,658 (74,768)
2006-2007	75,934	88,645	34,027 (4,538)	198,606	[82,981] 389,661 (75,590)
Dec. 2007	76,759	88,728	34,700 (4,960)	200,187	NA

Sources: Department of Family for number of spaces; Québec's Institute of Statistics for number of children by age.
1. This designation applies more strictly from September 1997. 2. From 1999 to 2003, the government froze the number of for-profit childcare centers under agreement, which also offered spaces at the $5 per day fee; few new spaces were added for this arrangement during this period. 3. Figures in parenthesis represent spaces in daycare center without an "agreement," that are not subsidized but are licensed and regulated. Those centers are free to choose their daily fee. 4. The reduced ($5 per day fee) program began on September 1997 for the children aged 4 by September. By January 1 2004, the daily fee was raised to $7. 5. The $5 per day fee policy was extended to the 3-year-olds on September 1998, the 2-year-olds on September 1999 and to children of all ages not eligible for kindergarten on September 2000 (fifth birthday after 30 September).

Table 2: Québec's budgetary credits for the childcare program in millions of dollars by fiscal year (April to March), 1996 to 2008

Fiscal year	Not-for-profit network Center and family childcare	For-profit centers	Parent fee-subsidy for daycare and special grants in millions of $	Total subsidies[1]	Subsidy per space in $
1996-1997	160	6	122	288	3,888
1997-1998	150	5	129	294	3,832
1998-1999	334	56	80	470	4,890
1999-2000	505	110	27	642	5,654
2000-2001	695	138	11	844	6,376
2001-2002	872	148	1	1,020	7,004
2002-2003	1,019	187	≈ 0	1,206	7,379
2003-2004	1,099	211	≈ 0	1,310[2]	7,366
2004-2005	1,162	224	≈ 0	1,386[2]	7,319
2005-2006	1,178	252	≈ 0	1,493[2]	7,593
2006-2007	1,288	287	≈ 0	1,612[2]	8,114
2007-2008	1,310	312	≈ 0	1,692[2]	8,452[3]
2008-2009	1,370	344	≈ 0	1,796[2]	NA

Sources: For total subsidy, Expenditure Budget (annual), Québec's Treasury Board; for number of spaces, Table 1. 1. The funding includes one-time grants (e.g. start-up), recurring operating grants, special needs funding, and other grants. 2. Including interest and capital charges for not-for-profit centers and government contributions to the retirement plan of employees in all centers. Since January 1st, the fee per day has been fixed at $7 instead of $5. 3. Spaces in December 2007.

Table 3: Breakdown of children attending ($5 per day) daycare by age on September 30th and setting, March 2000 and 2004, and number of Québec's children by age on July 1st 2000 and 2004[1]

Age of children in years	Number of children in subsidized daycare						Number of children in Québec 2002 | 2004 (3) | (4)	Ratios		
	2000			2004				(2)/(1) (5)	(1)/(3) % (6)	(2)/(4) % (7)
	Daycare centre	Family-based	Total (1)	Daycare centre	Family-based	Total (2)				
<1	4,925	7,303	12,228	5,345	9,575	14,920	74,157 | 74,287	1.22	16.5	20.0
1	9,452	9,927	19,379	16,575	20,205	36,780	74,902 | 73,319	1.90	25.9	50.2
2	16,308	12,121	28,519	21,320	18,670	39,990	78,180 | 74,207	1.40	36.5	53.9
3	22,273	14,159	36,432	27,275	17,055	44,330	83,488 | 73,853	1.22	43.6	60.0
4	25,177	12,111	37,790	30,375	13,590	43,965	88,699 | 75,579	1.16	42.6	58.2
0-4	78,135	56,213	134,348	102,075	77,981	180,056	399,426|371,245	1.34	33.6	48.5
5[1]	819	2,504	3,323	1,065	1,185	2,179	Not relevant	Not relevant		
TOTAL	78,954	58,717	137,671	103,140	79,095	182,235				

Sources: Analysis of the Report of Activities submitted by the childcare services, 2000-2001 and 2003-2004, Department of Family; Québec's Institute of Statistics for number of children in Québec, and authors' calculation. 1. About seven hundred 6-year-old kindergarten children are included and about half of the 5-year-old children are not in kindergarten.

Table 4: Estimated effects (p-value of bootstrapped standard errors) of the policy on hours in daycare per week by children's age and mothers' level of education and cycle

Years (Cycle) Equation 2	Children by age				
	<1	1	2	3	4
All children					
β_3	-0.89 (1.17)	1.88 (1.05)*	2.66 (1.71)	1.75 (1.49)	1.46 (1.71)
β_4	6.02 (1.34)***	3.96 (1.38)***	7.57 (1.47)***	5.63 (1.37)***	5.14 (1.87)**
β_5	7.46 (1.70)***	7.97 (1.59)***	10.29 (1.74)***	7.63 (1.68)***	6.84 (1.52)***
β_6	-0.33 (1.30)	10.46 (1.51)***	11.65 (1.88)***	9.46 (1.82)***	8.95 (2.16)***
Observations	9,968	16,004	10,246	12,965	9,745
H0 test[1]	0.00	0.00	0.00	0.00	0.01
Children of Mothers with a level of education equal to a secondary diploma or less					
β_3	-0.78 (1.75)	1.70 (1.63)	4.49 (2.86)	-1.28 (2.84)	-5.34 (2.57)**
β_4	3.49 (2.07)*	3.75 (2.33)	3.71 (2.14)*	1.45 (2.31)	2.54 (3.56)
β_5	11.71 (3.28)***	4.22 (2.55)*	10.37 (2.96)***	5.58 (3.26)*	2.12 (2.57)
β_6	0.28 (1.83)	11.22 (2.65)***	14.98 (2.86)***	6.48 (3.16)**	3.66 (3.65)
Observations	3,018	4,910	3,263	4,292	3,147
H0 test[1]	0.00	0.00	0.00	0.05	0.00
Children of Mothers with a level of education equal to a university degree or more					
β_3	0.02 (1.92)	2.60 (1.75)	0.34 (2.51)	3.20 (2.22)	3.42 (2.82)
β_4	7.07 (2.13)***	6.33 (2.28) **	7.59 (2.29)***	7.15 (1.93)***	3.69 (2.52)
β_5	8.18 (2.52)***	9.93 (2.38)***	9.26 (2.41)***	9.02 (2.42)***	9.20 (2.49)***
β_6	-1.21 (1.66)	9.61 (2.11)***	7.96 (3.06)**	11.66 (2.51)***	11.86 (2.97)***
Observations	4,625	7,359	4,774	5,885	4,406
H0 test[1]	0.00	0.00	0.00	0.03	0.08

Source: Authors' estimation from the NLSCY Micro Data Files, cycles 1(1994-1995) to 6 (2004-2005).

1. P-value of the hypothesis that policy effects are equal. The hypothesis is always rejected.

Level of significance: * at 10%; ** at 5%; *** 1%.

Table 5: Impact of Québec's childcare policy on PPVT scores by children's age and mother's education and selected samples (bootstrapped standard errors in parenthesis)

Dependent variable and samples	Specifications and Estimated Treatment Parameter(s)			
	(i) Uniform effect Equation 1A	(ii) Unequal effects Equation 1		
	β	β_4	β_5	β_6
5-year-olds and mothers of all 10 provinces				
1. PPVT-SD; (N=17,203) and no covariates[1]	-4.28*** (1.05)	-4.82***(1.30)	-3.65***(1.18)	-4.35***(1.51)
H0: equal policy effects	-	0.61		
2. PPVT-SD; (N=17,154)	-3.78***(0.99)	-4.16***(1.23)	-3.15***(1.11)	-4.02***(1.36)
H0: equal policy effects	-	0.62		
3. PPVT-Raw; (N=17,154)	-4.93***(1.21)	-4.74***(1.53)	-4.91***(1.36)	-5.18***(1.68)
H0: equal policy effects	-	0.95		
5-year-olds and low-education (secondary diploma or less) mothers of all 10 provinces				
4. PPVT-SD; (N=5,383)	-3.78**(1.75)	-2.32 (2.25)	-3.81**(1.93)	-5.49**(2.39)
H0: equal policy effects	-	0.43		
5-year-olds and high-education (university diploma or more) mothers of all 10 provinces				
5. PPVT-SD; (N=7,758)	-3.05**(1.38)	-3.34**(1.55)	-2.56 (1.64)	-3.18*(1.90)
H0: equal policy effects	-	0.88		
5-year-olds and mothers of Québec and Ontario				
6. PPVT-SD; (N=7,259)	-4.05***(1.14)	-4.34***(1.36)	-3.55***(1.25)	-4.26***(1.48)
H0: equal policy effects	-	0.75		
4-year-olds and mothers of all 10 provinces				
7. PPVT-SD; (N=8,901) and no covariates[1]	-2.36*(1.21)	-1.90 (1.65)	-2.10 (1.51)	-3.22*(1.77)
H0: equal policy effects	-	0.78		
8. PPVT-SD; (N=8,875)	-1.29 (1.15)	-0.19 (1.56)	-0.93(1.40)	-3.05*(1.56)
H0: equal policy effects	-	0.26		
9. PPVT-Raw; (N=8,891)	-1.26 (1.44)	0.55 (1.98)	-0.76 (1.77)	-4.02**(2.00)
H0: equal policy effects	-	0.13		
4-year-olds and low-education (secondary diploma or less) mothers of all 10 provinces				
10. PPVT-SD; (N=2,777)	-3.83*(2.11)	-1.35 (2.73)	-3.42 (2.41)	-7.20***(2.76)
H0: equal policy effects	-	0.15		
4-year-olds and high-education (university diploma or more) mothers of all 10 provinces				
11. PPVT-SD; (N=4,109)	0.73 (1.64)	1.63 (2.42)	0.07 (2.12)	0.43 (2.13)
H0: equal policy effects	-	0.83		
4-year-olds and mothers of Québec and Ontario				
12. PPVT-SD; (N=4,031)	0.55 (1.31)	1.72 (1.72)	1.08 (1.52)	-1.37 (1.68)
H0: equal policy effects	-	0.21		

1. No Covariates: all the controls presented in the table of descriptive statistics are excluded except the policy variables which appear in the present table; a dummy for the province of Québec; dummies variables for English speaking children in Québec and French speaking children in the Rest of Canada; and a constant.

H0: P-value of the hypothesis that policy effects are equal. Level of significance: * 10%; ** 5%; *** 1%.

Figure 1: Primary care arrangements for 0 to 5-year-olds, Québec and Rest of Canada, 1994-2004
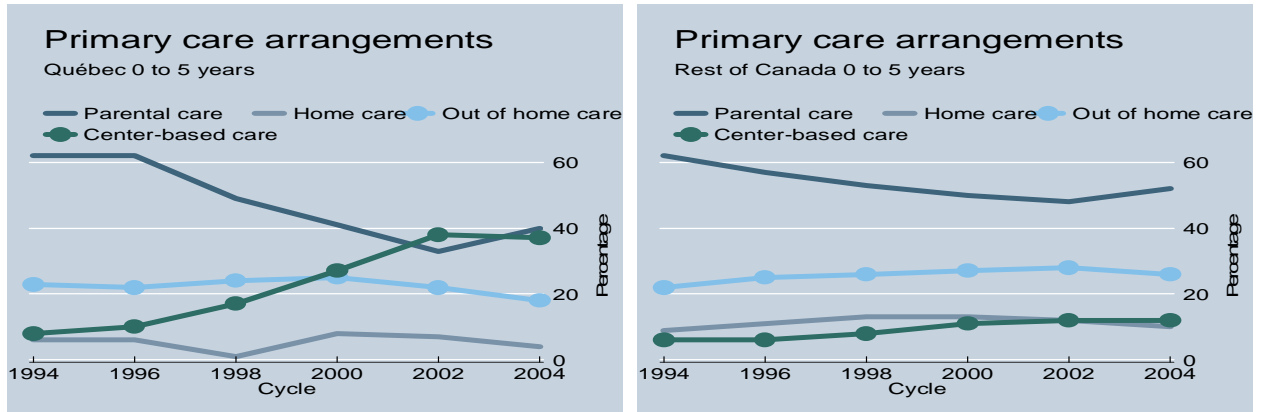
Source: Authors' compilation from the NLSCY Micro Data Files, cycles 1 to 6.

Figure 2: Mean hours per week spent in primary care arrangements (non conditional on care) by age of children, Québec (Q) and Rest of Canada (C), 1994-2004
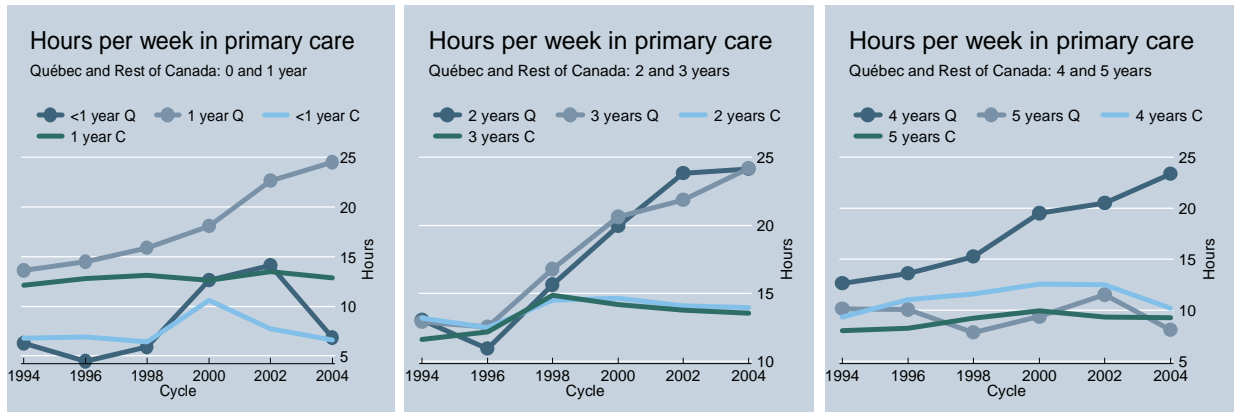
Source: Authors' compilation from the NLSCY Micro Data Files, cycles 1 to 6.

Figure 3: PPVT-R Standardized Scores of children ages 4 and 5, Québec (QC), Rest of Canada (RofC) and Ontario, by cycle of the NLSCY and by mothers' level of education for the 5-year-olds, Low (Led) and High (Hed)
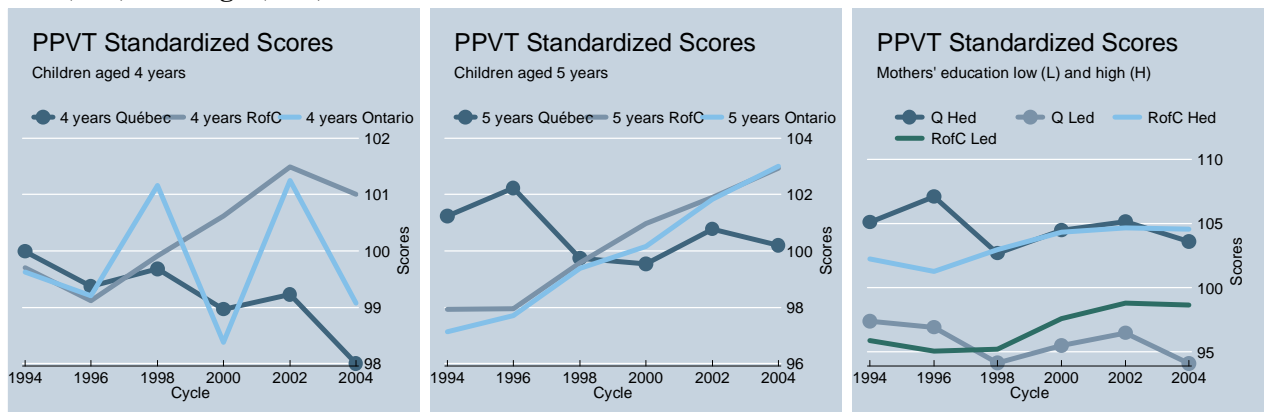
Source: Authors' compilation from the NLSCY Micro Data Files, cycles 1 to 6.

Table A1: Statistics Canada's National Longitudinal Survey of Children and Youth (NLSCY)

In Cycle 1 (1994-1995), a sample of 22,831 children aged 0 to 11 was selected in each of the 10 provinces making up the *first* longitudinal sample.[1]

In Cycle 2 (1996-1997), to reduce the response burden on families with several eligible children, the number of children selected was limited to two per family. Therefore, some children were dropped from the original sample (16,903 children remained in the longitudinal sample). Furthermore, a new initiative was added to the main longitudinal survey – 'Understanding the Early Years' (UEY) - which focused on a sample of children, aged 0 to 11 months and 1 to be followed until the age of 5, the *Early Childhood Development* (ECD) cohort. A total of 4,153 children were included in this *second* longitudinal cohort, approximately 2,000 children each of age 0 and 1, and also the new siblings of Cycle 1 longitudinal children who were already in the sample. This was the only cycle in which siblings from the original cohort were selected.[2]

In Cycle 3 (1998-1999), a new *third* longitudinal cohort of children aged 0 and 1 was created, repeating the UEY initiative which added "the readiness to learn" aspect of children entering the school system to its preoccupations. It was determined that a large sample of 5-year-olds was required to meet these analytical goals. Simultaneously, it was decided that a larger sample of 1-year-olds would meet those objectives once they were 5-year-olds in Cycle 5. Approximately 2,000 children aged 0 to 11 months, 7,944 1-year-olds and an additional sample of 7,052 5-year-olds were added to the preceding longitudinal cohorts.

In Cycle 4 (2000-2001), the longitudinal children introduced in Cycle 2 are now 4- and 5-year-olds; it is the last contact cycle for these children. A new *fourth* longitudinal cohort of children, aged 0 to 11 months (2,358) and 1 (2,673), was surveyed by Statistics Canada. As in the previous cycle, there were not enough 5-year-olds (introduced in Cycle 2) to meet the analytical goals of the "readiness to learn" objectives. A supplemental sample of 4,395 5-year-olds was selected across Canada.

In Cycles 5 (2002-2003) and 6 (2004-2005), new *fifth* and *sixth* longitudinal ECD cohorts of children aged 0 and 1 were selected for longitudinal purposes.[3]

Over all cycles, about 25 percent of children are from Québec and about 40 percent from Ontario. Two western provinces have a significant number of children of the same ages, British Columbia (10%) and Alberta (10%), but we considered that there are too few children to serve as a comparison group. It should be noted that although five new longitudinal cohorts were introduced in the survey in Cycles 2 to 6, these 0- and 1-year-olds are surveyed only three times until they are aged 4 or 5. Since only one cognitive test is administered when a child is aged 4 or 5, and because of the design of the ECD cohorts, no separate analysis using longitudinal data or fixed effect siblings analysis can be conducted.

1. A child's effective age at a cycle is with respect to December 31 of the reference year: thus, 0-year-olds are born in 1995 and 1-year-olds are born in 1994.
2. When the first ECD cohort of babies was selected for Cycle 2, the rule was a maximum of one child per household, except for twins, in which case both were sampled. At Cycle 5, the rule changed to one child per household without exception.
3. At Cycle 6, the only ECD children present were those introduced as babies in Cycles 4, 5 and 6, and a top-up sample of new 2- to 5-year-olds, in provinces other than Québec and Ontario. At the end of Cycle 6 collection, there were 4,684 responding ECD children and households.

Table A2: Characteristics of the children, mothers and families, 4- and 5-year-olds, Québec, cycles 1 to 6

Characteristics of child, mother and family	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6
	Four-Year-Olds						Five-Year-Olds					
Samples	322	259	309	247	363	211	271	220	1344	565	550	247
Weighed	85,586	82,778	65,192	78,395	65,581	61,338	83,912	87,709	75,433	74,940	69,773	63,112
PPVT-R Std	99.99	99.37	99.68	99.96	99.23	98.00	101.24	102.22	99.74	99.54	100.78	100.21
English in Québec	0.06	0.03	0.05	0.06	0.06	0.05	0.07	0.02	0.08	0.09	0.11	0.05
Child is a Girl	0.43	0.44	0.48	0.49	0.51	0.53	0.49	0.49	0.49	0.51	0.48	0.50
Single Parent	0.09	0.12	0.14	0.18	0.15	0.12	0.14	0.17	0.15	0.14	0.13	0.12
14-24 years old	0.24	0.21	0.24	0.20	0.30	0.26	0.22	0.21	0.22	0.27	0.24	0.27
25-29 years old	0.44	0.42	0.38	0.41	0.34	0.35	0.44	0.41	0.38	0.34	0.34	0.34
30-34 years old	0.27	0.27	0.30	0.30	0.27	0.25	0.27	0.31	0.30	0.27	0.29	0.28
35 years old or more	0.05	0.10	0.08	0.10	0.10	0.13	0.08	0.07	0.11	0.12	0.13	0.10
Not born in Canada	0.04	0.01	0.03	0.03	0.08	0.06	0.05	0.04	0.08	0.07	0.11	0.06
Primary education	0.18	0.12	0.15	0.12	0.16	0.16	0.24	0.16	0.17	0.17	0.15	0.16
Secondary diploma	0.18	0.15	0.12	0.17	0.24	0.23	0.16	0.15	0.14	0.17	0.22	0.20
Post-secondary	0.26	0.29	0.23	0.23	0.20	0.12	0.28	0.25	0.27	0.20	0.22	0.08
University diploma	0.39	0.44	0.49	0.48	0.39	0.49	0.32	0.44	0.42	0.46	0.42	0.56
One Older Child	0.34	0.29	0.40	0.56	0.34	0.33	0.32	0.29	0.34	0.41	0.41	0.35
At Least 2 Older	0.16	0.12	0.13	0.12	0.16	0.15	0.17	0.12	0.15	0.13	0.16	0.18
Younger Children	0.52	0.47	0.38	0.29	0.42	0.40	0.51	0.58	0.42	0.39	0.36	0.39
Children of same age	0.02	0.00	0.04	0.03	0.00	0.00	0.00	0.00	0.04	0.03	0.05	0.02
Neither Brother/Sister	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Step-parent	0.05	0.02	0.02	0.04	0.04	0.03	0.04	0.02	0.05	0.04	0.04	0.03
Inhabitants >=500,000	0.24	0.29	0.30	0.35	0.40	0.35	0.23	0.27	0.57	0.49	0.55	0.31
100,000 to 499,999	0.20	0.16	0.16	0.15	0.11	0.14	0.22	0.17	0.07	0.08	0.08	0.08
30,000 to 99,999	0.14	0.17	0.15	0.14	0.10	0.06	0.14	0.12	0.11	0.07	0.10	0.08
30,000< inhabitants	0.15	0.20	0.19	0.14	0.21	0.26	0.14	0.18	0.11	0.17	0.16	0.32
Rural	0.27	0.19	0.21	0.21	0.18	0.19	0.28	0.27	0.14	0.19	0.11	0.22
Family income(2001$)	51,661	50,673	54,055	62,587	61,111	62,130	48,069	49,414	58,724	66,094	65,024	61,206

Source: Authors' compilation from the NLSCY Micro Data Files, cycles 1 to 6.

Table A3: Characteristics of the children, mothers and families, 4- and 5-year-olds, Rest of Canada (nine other provinces), cycle 1 to 6

Characteristics of child, mother and family	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6
			Four-Year-Olds						Five-Year-Olds			
Samples	1354	1054	1097	909	1588	1162	1262	996	4171	3285	2882	1361
Weighed	261,268	263,258	203,075	238,202	224,687	215,100	261,451	269,172	233,377	224,733	235,567	229,693
PPVT-R Std	99.70	99.12	99.91	100.62	101.49	101.01	97.93	97.94	99.59	100.97	101.90	102.94
French in Rest of Can.	0.03	0.04	0.03	0.02	0.03	0.03	0.04	0.07	0.03	0.04	0.02	0.03
Child is a Girl	0.52	0.49	0.51	0.50	0.52	0.47	0.49	0.46	0.48	0.49	0.50	0.50
Single Parent	0.15	0.14	0.16	0.14	0.14	0.12	0.15	0.14	0.15	0.15	0.14	0.13
14-24 years old	0.26	0.23	0.23	0.23	0.22	0.22	0.26	0.25	0.22	0.26	0.23	0.21
25-29 years old	0.39	0.38	0.34	0.33	0.36	0.34	0.41	0.43	0.35	0.33	0.33	0.33
30-34 years old	0.25	0.28	0.32	0.32	0.28	0.29	0.25	0.23	0.32	0.30	0.30	0.31
35 years old or more	0.09	0.10	0.11	0.13	0.13	0.15	0.08	0.08	0.12	0.10	0.14	0.15
Not born in Canada	0.11	0.09	0.05	0.11	0.11	0.13	0.11	0.09	0.15	0.09	0.12	0.11
Primary education	0.14	0.11	0.09	0.10	0.11	0.09	0.17	0.12	0.12	0.11	0.11	0.09
Secondary diploma	0.22	0.20	0.17	0.18	0.23	0.23	0.19	0.20	0.19	0.19	0.23	0.23
Post-secondary	0.29	0.27	0.28	0.24	0.15	0.13	0.29	0.29	0.29	0.23	0.15	0.14
University diploma	0.34	0.42	0.46	0.47	0.51	0.55	0.36	0.40	0.40	0.48	0.51	0.54
One Older Child	0.35	0.37	0.37	0.53	0.38	0.36	0.36	0.34	0.35	0.39	0.37	0.39
At Least 2 Older Child	0.20	0.15	0.15	0.12	0.18	0.19	0.20	0.15	0.19	0.15	0.18	0.18
Younger Children	0.49	0.46	0.43	0.35	0.39	0.36	0.52	0.51	0.44	0.42	0.40	0.38
Children of same age	0.02	0.01	0.02	0.03	0.04	0.03	0.02	0.02	0.04	0.02	0.05	0.03
Neither Brother/Sister	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01
Step-parent	0.03	0.03	0.02	0.03	0.02	0.03	0.04	0.04	0.03	0.04	0.03	0.03
Inhabitants >=500,000	0.17	0.16	0.19	0.23	0.25	0.19	0.16	0.15	0.34	0.24	0.24	0.18
100,000 to 499,999	0.22	0.27	0.25	0.29	0.15	0.17	0.23	0.27	0.22	0.25	0.16	0.18
30,000 to 99,999	0.10	0.11	0.11	0.11	0.10	0.11	0.10	0.12	0.11	0.10	0.09	0.10
30,000< inhabitants	0.21	0.23	0.23	0.18	0.33	0.34	0.21	0.25	0.17	0.20	0.33	0.35
Rural	0.31	0.24	0.23	0.18	0.17	0.19	0.31	0.22	0.16	0.22	0.18	0.19
Family income(2001$)	52,913	52,195	59,586	69,278	66,667	63,292	51,753	53,129	63,260	61,638	64,467	64,484

Source: Authors' compilation from the NLSCY Micro Data Files, cycles 1 to 6.

Table A4: Mean scores of educational quality by dimension and overall characteristics of care by settings and age of children, Québec, 2003#

Characteristics	Non-profit center		Family-based	For-profit center	
	Infant daycare (0-18 months)	Preschool daycare (18 months to age 4)	Home daycare (0-5 years)	Infant daycare (0-18 months)	Preschool daycare (18 months-5 years)
Mean Scores by dimension (from 1.00 to 4.00)(Poor to Very Good)[1]					
1. Physical characteristics	2.91F	2.89F	2.65F	2.33L	2.47L
2. Structure and variation in activities	3.02G	3.02F	2.76F	2.66F	2.69F
3. Interaction between educators and children	3.12G	2.85F	2.76F	2.76F	2.54F
4. Interaction between educators and parents	3.38G	3.18G	2.97F	2.96F	2.83F
Percentage distribution of settings by overall quality[2]					
Unsatisfactory	3.4	5.5	20.9	28.5	37.4
Fair	36.0	52.7	60.0	62.1	51.9
Good or Very Good	60.6	41.8	19.1	9.5	10.7

Source: Québec Survey on the Quality of Educational Daycare in 2003, Québec's Institute of Statistics, 2004.

1. Very Good: 3.50 to 4.00; Good (G): 3.00 to 3.49; Fair (F): 2.50 to 2.99; Low (L): 2.00 to 2.49; Poor: 1.50 to 1.99; Very Poor: 1.00 to 1.99.

2. Unsatisfactory: 1.00 to 2.49; Fair: 2.50 to 2.99; Satisfactory: 3.00 to 3.49.

To obtain a representative portrait of the situation in the daycare network a survey was conducted on government-regulated daycare service providers across Québec in the spring of 2003. A representative sample of the survey's target population was chosen consisting of 905 children from some 650 establishments selected at random from the list of daycare service providers. The survey covers the following topics: Physical arrangement of facilities; Organization of activities; Interactions between childcare providers, children and parents; General characteristics of personnel and establishments.