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Quantitative Analysis of The Greater Saint John Early Childhood Hubs



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Project Title

Quantitative analysis of the Greater Saint John Early Childhood Hubs

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Executive Summary

The **Greater Saint John Early Childhood Hubs** play an important role in the city of Saint John, New Brunswick by providing low-income families with early childhood development opportunities – like preschool services – they may not otherwise have had access to. By removing financial hurdles, the Hubs make preschool support more accessible for families in need.

To determine whether the Early Childhood Hubs preschool program (known informally as the "Hubs program") is reaching those who need it most, it is important to understand who is using it, including participants' demographic and socioeconomic circumstances. Understanding the traits of who might attend in the future can help plan and deliver more targeted services moving forward.

To this end, this study examines the traits of Hubs program participants, as well as the potential effects of participating in the program. It attempts to answer three key questions:

1. What are the characteristics of families and children participating in the Hubs program as compared to non-participants?

2. Based on statistical modeling and participant data measured before the start of the 2021-2022 and 2022-2023 Hubs programs, are there characteristics that can help us understand which families are more likely to sign up for the Hubs program?

3. Is there an association between participating in the Hubs program and access to health services (demonstrated, for example, through visits to hospital Emergency Departments)?

Highlight of Findings

Participant Characteristics

- Just over one-third (36%) of families participating in the Hubs program are single parent/guardian households. To put this into perspective, this is lower than the 48% of Saint John families and 46% of NB families with at least one child aged 2-4, that are single parent/guardian households.

- Around 35% of primary household contacts for children in the Hubs program are immigrants (i.e., either permanent residents or temporary residents). This rate is substantially higher than the overall percentage of permanent and temporary residents who are primary household contacts for children aged 2-4 in the Saint John population (13%).

- A large proportion of children in the Hubs program reside in neighbourhoods that the Canadian Index of Multiple Deprivation (CIMD) classifies as among the most deprived in the Atlantic region.

- 59% are in neighbourhoods considered the most deprived in terms of Ethnocultural Composition – meaning these areas have a higher concentration of newcomers and cultural or language differences that may affect access to services.

- 56% of participants are in neighbourhoods considered the most deprived in terms of Situational Vulnerability – meaning many residents face difficult life circumstances that increase their vulnerability.

- Likewise, the neighbourhoods of families participating in the Hubs program have a much lower before tax income per single person equivalent (BTIPPE) than the population-wide control groups.

    - Participants' neighbourhoods have an average BTIPPE of $26,400. Meanwhile, families with children aged 2-4 in Saint John and across NB have an average neighbourhood BTIPPE of $41,100 and $47,100, respectively.

Access to Health Services

- Having an Emergency Department (ED) visit in the two years prior to the start of the Hubs program is associated with a higher likelihood of participation in the program.

- Likewise, participation in the Hubs program is a statistically significant predictor of having an ED visit in the 9 months after finishing the program – when compared to children of similar age and backgrounds in New Brunswick.

    - It should be noted that participating in the Hubs program does not cause more ED visits. Instead, this finding could indicate that families who enroll in the program have a higher risk of adverse events – possibly due to unmet healthcare needs that could result from a lack of access to primary care and other support services.

Key Takeaways

Overall, our findings suggest the Hubs program is reaching families in need, especially immigrants and low-income families.

As intended, the Hubs program is being attended by families with young children living in lower-income areas, as indicated by the low average income in participants' neighbourhoods ($26,400 BTIPPE). Participating households are also supporting larger families (4.61 people) than the provincial average (3.72 people) with smaller incomes, and over half (55%) of these have social assistance case records – indicating a higher need for financial and social supports. For these families, the Hubs program provides reliable, low-cost childcare and has the potential to reduce stress related to limited financial resources. It may even act as a stepping-stone for

parents to increase employability, such as by working more hours or attending training programs while their children are in a safe educational setting.

The Early Childhood Hubs are located in lower-income neighbourhoods that are home to many newcomer families, which likely contributes to their strong representation in the preschool program. Being situated in these communities, the Hubs program helps reduce barriers to early learning. As immigrant families are less likely to be single parent/guardian households this may explain the lower proportion of single parent/guardian participation in the program. However, they often face other challenges, such as learning a new language and adapting to a new culture. For these families, the Hubs can serve as a bridge to the broader Saint John community, providing much needed supports in terms of social integration, settlement and preparation for school.

Data limitations make it difficult to draw conclusions about the Hubs program's impact on school grades. However, the available information shows that children in the program went on to have lower grades in kindergarten than the average for Saint John and NB. That being said, when we look at the proportion of children meeting or exceeding learning expectations, we see that program participants were closer to the regional and provincial average in English Language Arts than they were in Math. This could suggest the Hubs program is supporting children's language learning – an important skill when preparing for kindergarten, especially among immigrant families whose first language might not be English.

Participants also had lower grades in kindergarten than the control group. This should not be interpreted as an issue with the Hubs program but rather as an acknowledgement of the systemic issues faced by children that hail from lower income neighbourhoods, also demonstrated by lower scores than average in the control group.

Finally, data also show that families in the Hubs program have higher rates of ED visits than the control group and the Saint John and NB average – both before and after their time in the program. This does not mean that attending the Hubs program causes poorer health. Rather, it suggests that for many participating families, the ED might be their first or only accessible point of care, underscoring the need for ongoing support systems beyond childcare (i.e., better access to primary care providers or language assistance at medical clinics).

Findings show that the Hubs program is serving vulnerable families faced with financial challenges and other struggles, such as community integration. While the provision of free childcare and early childhood education helps address these needs, families in the program could likely benefit from other complementary supports. Immigrant families in particular are likely to enroll in the program in future, so there may be a need to integrate services that support their integration into the community.

The Early Childhood Hubs are well-positioned to help provide community supports and facilitate connections – such as through helping immigrant families learn about local resources like recreation programs and language supports. They also have the potential to boost health literacy among participating families by sharing information and resources on primary and preventive healthcare services available in the region. If the ED is in fact participating families'

first point of care, knowledge of community services or at-home preventive actions may help families address health concerns before there is a need for emergency care.

This study provides some key insights that may be used to plan for future Hubs program delivery, but future research is still recommended. As more time passes, more data will become available – and the larger sample size and more years of participant data and school grades would allow for a better investigation of the Hubs program's impact on school outcomes over time.

Introduction

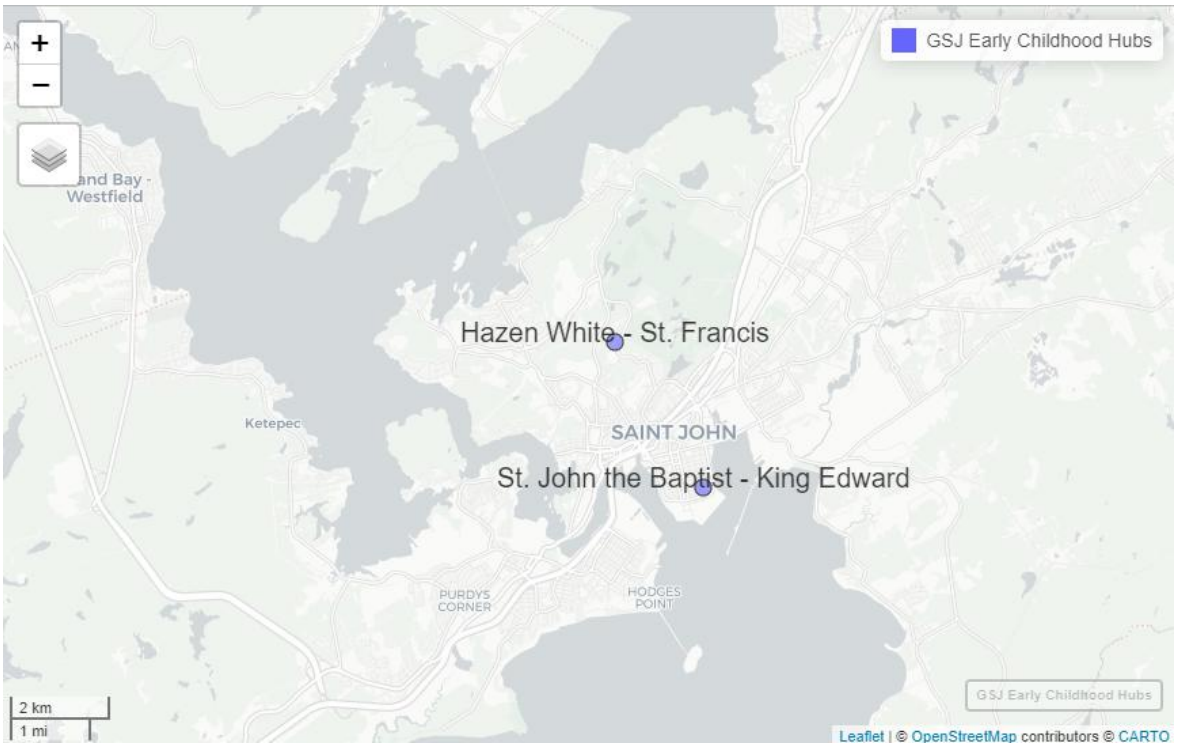
The purpose of this study is to characterize the demographics, socioeconomic circumstances and access to health services among children and families who participated in the Greater Saint John (GSJ) Early Childhood Hubs preschool program (known informally as the "Hubs program") offered by the YMCA. This report aims to help inform future Hubs program planning and delivery to reach families with the greatest need.

Background: Greater Saint John (GSJ) Early Childhood Hubs Program

Back in 2003, the Saint John Early Childhood Development Coalition[1] proposed a new model of early learning that could better serve children living in poverty (Paterson, 2024; YMCA, 2024). This led to the eventual creation of Saint John's first Early Learning Centre – one of four provincial demonstration sites dedicated to addressing the early educational needs of families living in low-income neighbourhoods (YMCA, 2024).

Following the success of the initial Early Learning Centre, this work was expanded through the launch of the **GSJ Early Childhood Hubs** – located in two Saint John elementary schools.

Figure 1: Locations of GSJ Early Childhood Hubs



[1] Founding members of the Saint John Early Childhood Coalition include the Business-Community Anti-Poverty Initiative, the YMCA of Greater Saint John, the Family Resource Centre, the Anglophone South School District, Horizon Health Network and the Department of Social Development (YMCA, 2024).

The South End Hub is located at the St. John the Baptist/King Edward School, while the North End Hub is located at the Hazen White-St. Francis School (YMCA, 2024) – both in neighbourhoods with lower median household incomes.

New Brunswick (NB) has the fourth-highest rate of child poverty among the Canadian provinces, with the city of Saint John having among the highest child poverty rates in NB (over 29% in 2022) (Human Development Council, 2024). According to Statistics Canada (StatCan) Census data from 2021, median total income in the Saint John Census Subdivision[2] lags behind NB's two other largest cities, Moncton and Fredericton (StatCan, 2023b). Moreover, the 2020 median household incomes in the Hazen White-St. Francis and St. John the Baptist/King Edward Dissemination Areas[3] are $46,000 and $53,200, respectively – both substantially lower than the 2020 NB median household income of $70,000 (StatCan, 2023b).

Children living in poverty can face developmental delays from a lack of access to quality early learning opportunities. The Hubs aim to reduce these effects by offering critical early learning, support services and community connections for families in vulnerable neighbourhoods. By removing financial hurdles that may have blocked families' access to early childhood development opportunities, the Hubs make preschool programming more accessible for families in need. They give impoverished children up to 5 years old, and their families, access to key growth opportunities to help them thrive and be ready for Kindergarten (YMCA, 2024).

The Hubs also play an important role in helping immigrant families adjust to life in Saint John. Census data show a rising number of immigrants settling in Saint John in recent years. Between 2011 and 2015, around 760 new immigrants arrived in the city; and from 2016 to the opening of the second Hub site in 2021, that number more than tripled to 2490 new arrivals (StatCan, 2023b). As more families arrive in Saint John, demand for accessible childcare – and for the Hubs – will grow, highlighting the need to plan for future participants with more targeted services.

Using linked, de-identified administrative data and Hubs program participation records, this report takes an initial step toward addressing that need by examining families with children aged 2-4 who participated in the Hubs program during the 2021-2022 and 2022-2023 school years (i.e., September 2021 to June 2022; September 2022 to June 2023) and comparing them to similar non-participating families across New Brunswick. While the findings offer valuable insights, additional data over time will be needed to provide a more complete understanding of the program impacts and to support long-term planning.

The report describes the personal and neighbourhood characteristics and ED visits of Hubs program participants in comparison to a control group of statistically similar non-participants across NB, as well as the broad population of families with children aged 2-4 living in Saint John and in NB as a whole. This report provides insights into the needs of and challenges facing children and families using the Hubs program – including those likely to enroll in the future.

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[2] According to Statistics Canada, a Census Subdivision is a geographic area that usually corresponds to a municipality or equivalent local government area, such as a city, town or rural district (2023a).
[3] According to Statistics Canada, a Dissemination Area "is a small, relatively stable geographic unit composed of one or more adjacent dissemination blocks with an average population of 400 to 700 persons" (2021).

Data

The New Brunswick Institute for Research, Data and Training (NB-IRDT) houses numerous administrative data sets containing information on individuals living in NB. Table 1 below presents the NB-IRDT data sets, and the applicable date ranges, used in the creation of this report. External data on Hubs program participants were provided by the Greater Saint John YMCA for the 2021-2022 and 2022-2023 program years.

Table 1: NB-IRDT Data Sets Used in This Study

Dataset Name	Start Date	End Date
Citizen Data	Jan 01, 2018	Feb 01, 2023
Permanent Resident Data	Jan 01, 2001	Mar 31, 2023
Transition Data	Jan 01, 2001	Mar 31, 2023
Horizon Emergency Department Data	Jan 01, 2017	Mar 31, 2024
Discharge Abstract Data (DAD)	Jan 01, 2019	Mar 31, 2023
Healthy Toddler Assessments	Jan 01, 2016	Jan 29, 2021
Social Assistance Data (NB Case) (SD-SA1)	Jan 01, 2016	Sep 09, 2019
Report Card Data (Anglophone Sector)	Jan 01, 2018	Jun 30, 2023

Note: The Transition Database contains Temporary Residents that may transition to Permanent Residents.

Citizen Data

The Citizen Data contains demographic and geographic data for all Medicare cardholders in NB. All address changes within the province are tracked, and this study leverages this information to identify each household's address at the time of their child's participation in the Hubs program. This study uses Citizen Data records ranging from January 2018 to February 2023, although the data set encompasses records dating back to 1971. The requested timeframe covers the Hubs program participants that either had an address in NB before the start of the program in September 2021 or gained one during the program.

For most descriptive statistics taken from the Citizen Data, calculations were made at the start of the 2021-2022 school year in September as available, including location of residence and demographic information. For instance, when the average age of a group of children is presented in the results section, it reflects the average age as of September 1 of the school year.

Permanent Resident Data

The Permanent Resident Data holds information on individuals who immigrated to NB with a permanent resident status, including their landing dates. The data utilized in this report extend back to January 2001 and end in the first quarter of 2023. This range should capture landings for households that became permanent residents prior to the 2021 preschool program starting.

Transition Data
The Transition Data traces the immigration history of temporary residents in NB, including work permit holders and students. The Transition Data covers the same period of time as the Permanent Resident Data: starting in January 2001 and ending in the first quarter of 2023. In this study, the term "immigrant" includes both permanent residents and temporary residents.

Horizon Emergency Department Data
Horizon Health Network is one of NB's two Regional Health Authorities, which operate hospitals and other health services across the province. Two of the hospitals operated by the Horizon Health Network are in Saint John. The Horizon Emergency Department Data has records of Emergency Department (ED) visits, and this report utilizes ER records from January 2018 to March 2024 to consider ER visit incidence both pre- and post- participation in the Hubs program.

Discharge Abstract Data (DAD)
The DAD contains records of admissions to and discharges from public hospitals in NB. This study utilizes DAD records from January 2019 to March 2023. Because data are not currently available beyond March 2023, it should be noted that it is not possible to observe hospitalizations of Hubs program participants after the conclusion of the second observed school year (2022-2023).

Healthy Toddler Assessments
The Healthy Toddler Assessment is a survey administered voluntarily to children in NB when they reach 18 months of age. The assessment evaluates the physical, environmental and social wellbeing of toddlers based on numerous risk factors. This study utilizes Healthy Toddler Assessment data ranging from January 2016 to January 2021 (the most recent date available). This date range allows for most 2021-2022 Hubs program participants to have had an opportunity to take the assessment before participating in the program. However, participants in the 2022-2023 Hubs program are less likely to have been assessed by January 2021 due to their age.

Social Assistance Data (NB Case) (SD-SA1)
The Social Assistance Data contains case records from the NB Department of Social Development that indicate whether an individual put in a request for daycare-related social assistance. Because Social Assistance Data records are only available until September 2019, this information predates program participation. However, it does provide information on historical social assistance receipt among families whose children did or did not subsequently attend the Hubs program.

Report Card Data (Anglophone Sector)
The Report Card Data used in this report includes class grades for students in schools in NB's Anglophone Sector. Most schools in Saint John are in the Anglophone Sector, including the two school sites where Early Childhood Hubs are located. The data set includes grades up to and including the 2022-2023 school year. For elementary school students, grades are assigned on a four-point scale, with 4 indicating a child is exceeding grade-appropriate competencies. Because the 2022-2023 Hubs program ended recently, only kindergarten grades are currently available for analysis.

Methodology

The main part of this report presents descriptive statistics on the composition of children aged 2-4 in the Hubs program. Participating children and their families are referred to as **the treatment group**.

To provide context, we also include results for a comparison group of similar children who did not participate in the program, referred to as **the control group**. Children in the control group were selected from the wider Saint John population because they were statistically similar to children in the treatment group. The matching process (described below) helps identify what traits are linked to program participation.

A statistical method known as Propensity Score Matching (PSM) was used to select de-identified control group children that match well with treatment group children based on four indicators: sex, age in months, the number of people in their home and the average before-tax income in their neighbourhood. It should be noted that control variables do not need to match exactly to treatment cases; the objective is to find the best possible matches among eligible children.

PSM was performed on a subgroup of children between the ages of 2 and 4 that reside in the Saint John Census Subdivision (as of September 1, 2021), just like the treatment group children. The control-to-treatment ratio used in this report is 4:1, meaning that for every child in the treatment group, another four matching children were selected for the control group where there were sufficient eligible matches to do so. Additional details on the statistical matching process can be found in Appendix 2.

To provide additional context for the characteristics of children participating in the Hubs program, this report also compares the characteristics and results for the treatment and control groups to wider populations of unmatched children, including the following:

1. The population of children aged 2 to 4 living in Saint John at the time the 2021-2022 Hubs program started.

2. The wider population of children aged 2 to 4 living in New Brunswick at the time the 2021-2022 Hubs program started.

Multivariate Logistic Regression

Multivariate logistic regression is a statistical method that employs independent variables to model outcomes of a binary dependent variable. In other words, for example, regression allows researchers to identify correlations between Hubs program participation and different outcomes of interest (like ER visits or educational outcomes) after accounting for differences in children's observable characteristics, such as neighbourhood of residence, that might also be expected to affect those outcomes.

This report uses three multivariate logistic regression models to study key outcomes. Each model is briefly described below, with formulas and results presented in Appendix 3.

Model 1 – GSJ Early Childhood Hubs Program Participation

In Model 1, the dependent variable is an indicator for participation in the Hubs program. The variable is coded as "0" if the child was not a participant (i.e., they were in the control group) and coded as "1" if they were in the treatment group. Other variables included in the regression are age, sex, number of people in home, neighbourhood socioeconomic status and immigration status. Two separate independent variables of interest flag whether a child visited the ER and/or was hospitalized in the two years prior to participating in the Hubs program. This regression helps to identify factors most associated with participation in the Hubs program.

Model 2 – ED Visits After GSJ Early Childhood Hubs Program Participation

In Model 2, the dependent variable is an indicator for visiting the ED in the nine months after the end of the Hubs program (i.e., after June 2022 or 2023). The variable is coded as "0" if the child did not have an ED visit in the nine months after the end of the program, and it is coded as "1" if they did have an ED visit during that period. Other variables included in the regression are the same as in the previous regression, with the addition of a variable that indicates whether the child was a participant in the program. This regression helps to identify factors associated with an ED visit, including whether the child had previously participated in the Hubs program.

Model 3 – Difference-in-Difference

The third model considers the occurrence of ED visits for children both before and after participation in the Hubs program; as such, changes in the likelihood of an ED visit between these time periods could indicate a possible impact of the program itself. To account for other factors related to ED visits that might also have changed over time (such as number of people in household), changes in the outcome for the treatment group are compared to changes over time in the control group. The difference in the change over time between the two groups could indicate the impact of the program itself on this outcome.

This method is called a difference-in-difference model. All confounding variables from Model 1 and Model 2 remain in the formulation. Dummy indicators are added for the time (pre- or post-Hubs program) and Hubs program participation status. The main variable of interest is the interaction of the program and time period variables, which captures the additional effect of program participation for the treatment group after accounting for other factors that might also have changed over time.

Limitations

As suggested in the Data section above, this study's scope is limited by a small sample size and brief study period stemming from the two-year range (2021-2022 and 2022-2023) of program participant data available. Coupled with various limitations in the date ranges of NB-IRDT data sets (listed in Table 1), this results in a short window of observation for certain outcomes of interest, including educational, health and social support outcomes.

For instance, it would be preferable to measure the impacts of participation in the Hubs program by analyzing participants' Healthy Toddler Assessment (HTA) scores before enrolling in the program and analyzing schooling outcomes following their time in the program. However, HTA data are limited due to low response rates. Because the HTA is voluntary, and not all families participate – and because data are only available until January 2021 – HTA scores are available for fewer than one-third of program participants. Similarly, only being able to observe Kindergarten test scores for the first cohort of program participants makes it difficult to draw conclusions about program impacts. With more years of data, and a larger sample size, it would be possible to examine trends over time in HTA response rates and in the outcomes of those who responded.

Because of the restrictions in examining educational outcomes, this report instead considers and compares select health and social outcomes of Hubs program participants and matched non-participants, examining their families' interactions with social services and children's ED visits. Yet, this analysis is also limited by the small sample of program participants and a short observation window due to data ranges. For instance, because Social Assistance Data were not available more recently than September 2019, this report's examination of social assistance cases among treatment group families likely excludes some records of social support services.

To address these limitations, this report analyzes ED visits in the two years before and the nine months after program participation as a proxy measure for the accessibility of and potential need for support services. However, it is possible that unobserved factors may influence results (i.e., it is unlikely that participating in the Hubs program would increase ED visits due to health issues). Likewise, with such a small sample, unusual cases (outliers) may affect the results more than usual.

In future years, as more data become available, larger sample sizes will allow for stronger conclusions about the program's impact.

Descriptive Statistics

This section describes the characteristics of four subgroups of children: the treatment group of Hubs program participants, the control group of non-participants who are statistically matched to children in the treatment group, the population of children aged 2 to 4 living in Saint John at the start of the study period and the wider population of children aged 2 to 4 living in NB at the same time.

Table 2 displays the number of program participants by Hub site for the 2021-2022 and 2022-2023 programs. While some participants attended the preschool program in both years, there were 71 unique participants overall. For the purposes of this report, a participant attending both years is only counted toward the earlier year of 2021-2022 to avoid double counting.

Table 2: Number of Preschool Program Participants by Hub Site

School Year	North Site	South Site	Total
2021-2022	25	14	39
2022-2023	14	18	32
Total	**39**	**32**	**71**

Descriptive statistics for these groups of children are presented in Table 3 below. The average age of participants is roughly 48 months (4 years) old. The parent(s) or guardian(s) of treatment group children are younger on average than other parents or guardians of children from the control group as well as the wider populations.

The treatment group has a lower proportion of single parent/guardian households than all the other subgroups examined. Roughly 36% of treatment group families are single parent/guardian households, whereas just over 47% of families in Saint John with at least one child aged 2 to 4 are single parent/guardian households.

The share of NB households with one parent/guardian and at least one child aged 2 to 4 (46%) is much higher than the 2021 Census results for all single-parent households (16%). This variance is due to methodological differences primarily related to the granularity of the Census definitions, which are discussed further in Appendix 1.

The sizes of treatment households are also larger, on average, than for the three other subgroups.

Table 3: Demographics of Hubs Program Participants and Their Families

Demographic	Treatment	Control	Saint John	New Brunswick
Count	71	284	1944	24 044
Child Sex (%)				
Male	54.93	57.39	51.39	51.21
Female	45.07	42.61	48.61	48.79
Average Child Age (Months)	47.61	47.29	41.36	41.76
Average Age of Father/Male Guardian (Years)	35.83	36.91	36.15	36.18
Average Age of Mother/Female Guardian (Years)	31.10	31.83	32.24	32.60
Single Parent/Guardian Household (%)	36.36	49.61	47.65	46.10
Average Count - Children Under 18 in Home	2.96	2.88	2.23	2.17
Average Count - People in Home	4.61	4.43	3.78	3.72

The low percentage of single parent/guardian households in the treatment group is likely because it includes more recent immigrants (i.e., permanent and temporary residents who recently arrived in Saint John).

National statistics suggest that immigrant women are more likely to be part of a couple with children (i.e., a two-parent household) than Canadian-born women (Hudon, 2015). Immigrant mothers are also less likely to be single parents across younger (aged 15-24) and older (aged 25-54) age groups (Hudon, 2015). As such, the substantially higher proportion of immigrant families in the treatment group compared to the control, Saint John and NB groups (shown in Table 5) may be a contributing factor to the lower proportion of single parent/guardian households.

Table 4 shows the number of children that attended each Hub site as an immigrant (defined as having a primary household contact in the Citizen Data that is either a permanent resident or temporary resident). In the North Hub site, 18 of the 39 participating children (nearly half) can be classified as immigrants.

Table 4: Immigrant Preschool Program Participants by Hub Site

	North Site	South Site	Total
Immigrants	**18 (39)**	**6 (32)**	**24 (71)**

Note: Total participants for each site are in parentheses.

Table 5 presents the demographics of primary household contacts for children aged 2 to 4 in each of the four observed groups.

The split between male and female primary household contacts for the treatment group is even (50% male and 50% female). This deviates from the other three subgroups, which have a higher proportion of female primary household contacts. This can be explained in part by the higher

number of dual parent/guardian households in the treatment group, which is likely linked to the higher proportion of immigrant families.

According to the most recent records in the Citizen Data, the treatment group is more likely to have married primary household contacts compared to the other three subgroups (note that marital status is not a longitudinal indicator, so only the latest status is available).

Primary household contacts from the treatment group are more likely to be immigrants to NB (i.e., permanent residents or temporary residents) compared to other subgroups. Roughly 35% of treatment primary household contacts are either permanent residents or temporary residents, compared to less than 8% for all of NB. Immigrant families' primary household contacts for both the treatment and control subgroups have been in Canada for roughly three years, which is less than the Saint John and NB subgroups.

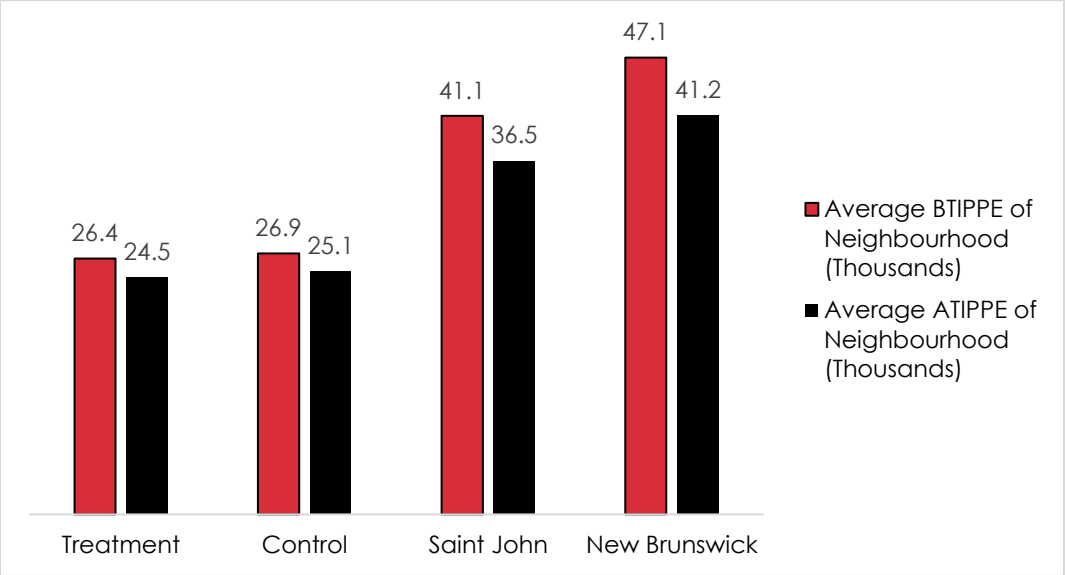
Table 5: Demographics of Primary Household Adult Contact for Children Aged 2 to 4

Demographic	Treatment	Control	Saint John	New Brunswick
Count	66	356	1742	18 426
Sex (%)				
Male	50.00	34.38	32.88	28.92
Female	50.00	65.63	67.12	71.08
Marital Status (%)				
Married	54.55	43.36	46.44	47.87
Single	45.45	49.61	48.11	44.74
Other	0	7.03	5.45	7.39
Average Age (Years)	33.50	34.06	33.19	33.53
Immigrant (%)	34.85	25.76	12.69	7.55
Years in Canada for Immigrants	2.79	2.96	4.01	3.89

The two Hubs sites are strategically located in neighbourhoods where families of lower socioeconomic status can benefit from access to preschool. To illustrate this, Figure 2 below presents the average neighbourhood before tax income per single person equivalent (BTIPPE) and neighbourhood after tax income per single person equivalent (ATIPPE) for families in each of the four subgroups.

Treatment group children reside in neighbourhoods with noticeably lower incomes (with an average BTIPPE for their neighbourhoods of $26,400) than the population of children of similar ages in Saint John and NB (with an average BTIPPE in their neighbourhoods of $41,100 and $47,100, respectively).

Figure 2: Socioeconomic Status of Neighbourhood



Note: BTIPPE = before tax income per single person equivalent
ATIPPE = after tax income per single person equivalent

The Canadian Index of Multiple Deprivation (CIMD) provides measures on four dimensions of inequality across neighbourhoods, including residential instability, economic dependency, ethno-cultural composition and situational vulnerability. CIMD results are based on neighbourhood-level information obtained from Statistics Canada's 2021 Census. Calculations for the index are aggregated by Dissemination Area (DA), from which quintiles are formed.

Figure 3 below reports the proportion of children belonging to each quintile for three selected dimensions of inequality based on the DA in which they reside. Although the CIMD uses four dimensions of inequality, "Residential Instability," has been removed due to low quintile counts that create privacy concerns.

Placement in the first quintile indicates the lowest level of deprivation, while 5 indicates the highest level of deprivation. Details on each dimension can be found through the Statistics Canada user guide (StatCan, 2024a).

For the Ethnocultural Composition and Situational Vulnerability dimensions of inequality, there are more treatment group children in the fifth quintile than all other quintiles combined (59% and 56% of the subgroup for those dimensions, respectively).

Figure 3: Canadian Index of Multiple Deprivation Quintile Proportions (Most Deprived Quintile is 5)

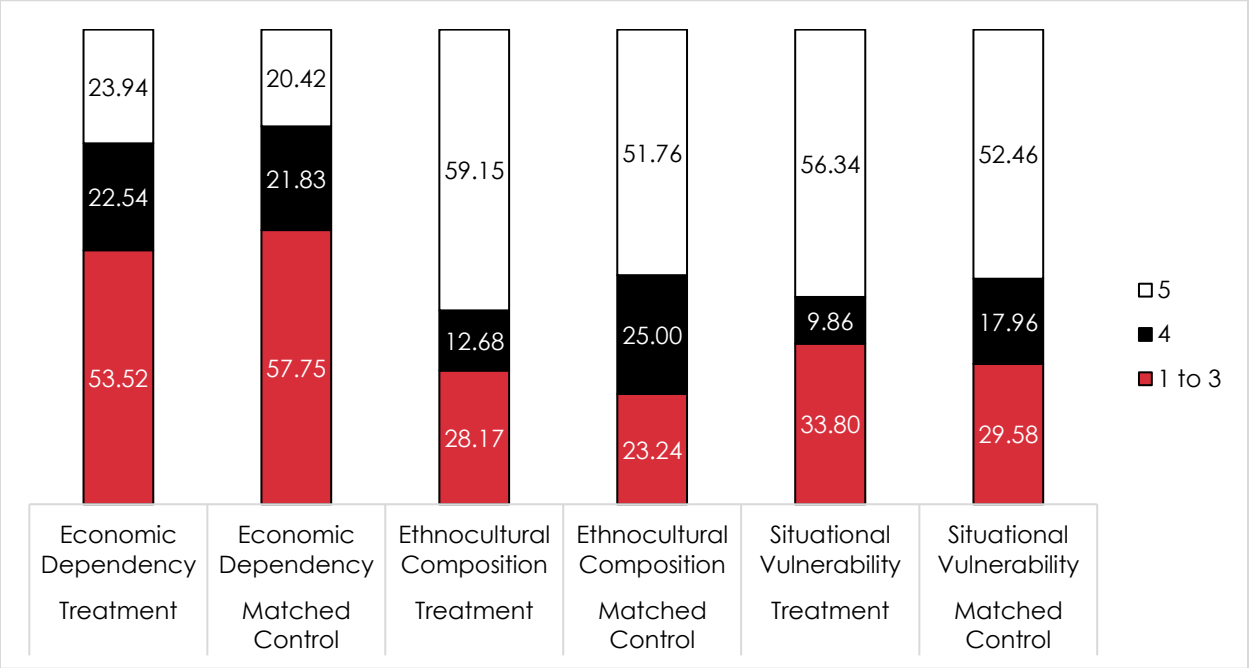


Table 6 presents the proportion of children from each subgroup linked to requests for daycare social assistance. The treatment and matched control groups have higher request rates for daycare social assistance (7% and 10%, respectively) than the general population of children in Saint John and NB (4% and 2%, respectively). This is expected given the treatment and control groups reside in lower income neighbourhoods, and the treatment group contains acknowledged preschool program attendees.

Table 6: Proportion of Children Associated with a Request for Daycare Social Assistance

	Treatment	Control	Saint John	New Brunswick
Children (%)	7.04	9.86	4.42	2.17

Table 7 similarly shows the proportion of primary household contacts with links to social assistance cases (though, they may not have necessarily received social assistance payments). There is a pronounced gap in social assistance cases linked to the treatment group (55%) and the NB population as a whole (29%). The primary household contacts of the control group children are linked to social assistance cases (69%) at over twice the provincial rate.

Although the treatment and control groups were statistically matched on several key characteristics, we note a difference between their associations with requests for daycare social assistance and social assistance cases in Tables 6 and 7. The lower rate among the treatment group could possibly be due to the higher proportion of immigrants in the treatment group, as temporary residents are not eligible to request daycare social assistance. Given the small sample, even a small number of temporary residents in the treatment group would lower the rate.

Table 7: Proportion of Primary Household Contacts with a Social Assistance Case

	Treatment	Control	Saint John	New Brunswick
Primary Household Contact (%)	54.55	69.14	45.75	28.89

Because of the limited time between the end of the 2021-2022 and 2022-2023 Hubs programs and the most recent available records in the Anglophone Sector Report Card Data (June 30, 2023), report card marks are not available for every participant. For those that do have report card scores, only kindergarten marks can be linked to those of the treatment group.

Table 8 shows the proportion of kindergarten class grades (up to three per subject per school year) meeting or exceeding learning expectations (defined as a grade of 3 or higher on the 1-4 scale) by subgroup in Anglophone Sector schools. Some grades are assigned an additional "+" designation to the number score (e.g. 3+) if the student demonstrated learning beyond the requirements of the grade but did not reach the level of the next number on the scale.

The additional subgroup in Table 8 ("Treatment DA") represents all children who were aged 2 to 4 on September 1, 2021, living in a DA in which at least one treatment group child also resided.

Table 8: Proportion of Anglophone Kindergarten Report Card Grades Meeting or Exceeding Learning Expectations

Subject	Treatment	Control	Treatment DA*	Saint John	New Brunswick
Mathematics	75.00	81.36	83.98	88.92	95.34
English Language Arts	73.53	75.79	79.45	85.66	90.46
All Subjects	85.34	89.92	90.44	93.22	95.17

**DA = Dissemination Area*
Note: Report card grades are not available for every Hubs program participant.

Across all subjects, the treatment group children reached learning expectations at a lower rate than the other subgroups. While kindergarten students in treatment group neighbourhoods ("Treatment DA") met learning expectations at lower rates in all subjects (90%) than Saint John students (93%), these rates are still higher than those of the actual treatment group participants (85%). In fact, as geographic scope expands farther beyond treatment group neighbourhoods, marks appear to improve. The rate of NB students meeting or exceeding learning expectations across all subjects (95%) exceeds the Saint John figure (93%).

The gap between class grades for the treatment and control groups in English Language Arts is smaller (roughly a 2-point difference) than the gap in Mathematics (over a 6-point difference). Because the sample size is limited, drawing conclusions about this difference is difficult. However, given the relatively large proportion of immigrants in the Hubs program, this could indicate the benefits of participants learning and engaging with the English language while in the program.

The average grades (presented on a 4-point scale) for Anglophone kindergarteners are shown in Table 9. As a reminder, not every Hubs program participant has grades available in the data set. Grades that originally had a "+" designation are presented without the symbol. For example, a grade of "3+" is shortened to 3 so that all grades are numeric. As with the results showing the proportion of kindergarteners meeting learning expectations in Table 8, Hubs program participants in Table 9 are shown to have lower report card grades than other subgroups.

The average grade for program participants across all subjects is 2.84, compared to the NB average of 2.98. The lowest grades for all groups are found in English Language Arts, except for the NB-wide subgroup, for which average English Language Arts grades match the average grades across all subjects.

Overall, the lower scores for Hubs program participants in kindergarten suggest that these children still face disadvantages compared to their peers, especially in mathematics. The lower scores for the treatment group should not be interpreted as an issue with the Hubs program but rather as an acknowledgement of the systemic issues faced by children that hail from lower income neighbourhoods, also demonstrated by lower scores in the control and treatment DA groups. The limited sample size makes it difficult to definitively claim Hubs program participants would achieve lower report card grades over time as the sample size grows.

Table 9: Average Anglophone Kindergarten Report Card Grades

Subject	Treatment	Control	Treatment DA*	Saint John	New Brunswick
Mathematics	2.74	2.82	2.83	2.88	2.99
English Language Arts	2.72	2.78	2.81	2.89	2.98
All Subjects	2.84	2.90	2.91	2.94	2.98

**DA = Dissemination Area. Note: Report card grades are not available for every Hubs program participant.*

Table 10 below shows the proportion of children who participated in a Healthy Toddler Assessment at 18 months of age across the four subgroups. It is interesting to note that the Healthy Toddler Assessment is administered to families with children aged 2-4 across NB at a notably higher rate (46%) than among families with children aged 2-4 in Saint John (29%).

It is also notable that a higher proportion of treatment group children (31%) participated in the Healthy Toddler Assessment than both the control (27%) and Saint John subgroups considering the assessment is voluntary. It is possible this could be due to the lower proportion of single parent/guardian households in the treatment group, as having more adults in the home could mean a family has more time or more flexibility to participate in the assessment.

Due to the small sample size of treatment group children administered the Healthy Toddler Assessment, this study does not report on outcomes of the assessment

Table 10: Proportion of Children Administered the Healthy Toddler Assessment

Subject	Treatment	Control	Saint John	New Brunswick
Children (%)	30.99	27.46	28.76	45.99

The 24-month hospitalization rate in the period leading up to the start of the Hubs program is presented in Table 11. Treatment group children are hospitalized at a higher rate (10%) than the broader Saint John and New Brunswick populations (9% and 7%, respectively), though at a lower rate than control group children (11%).

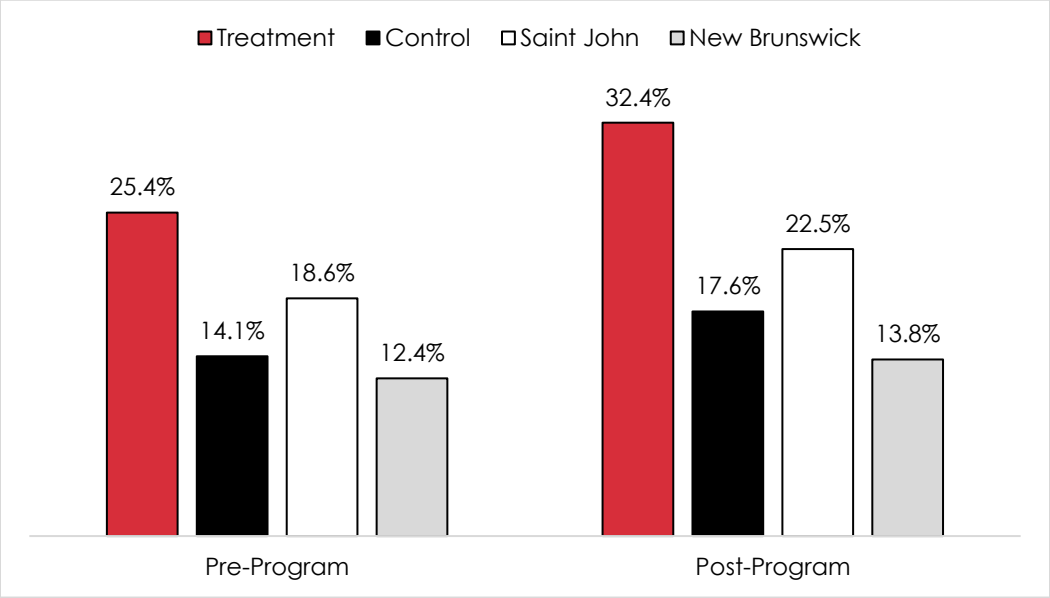
Table 11: Hospitalization Rate

Subject	Treatment	Control	Saint John	New Brunswick
Children (%)	9.86	10.56	8.69	7.45

Figure 4 shows the proportion of treatment and control children who visited the emergency department (ED) within nine months before and/or after participating in the Hubs program. The pre-program ED visitation rate is the percentage of children with at least one ED visit in the nine months before the start of the program, and the post-program ED visitation rate is the percentage of children with at least one visit in the nine months after the program ended.

For all subgroups, the ED visitation rate was higher after the running period of the Hubs program than before. For the treatment group, 25% of children had an ED visit in the 9 months before the preschool program, while the ED visitation rate after the program is 32%.[4]

Figure 4: ED Visitation Rates Nine Months Pre- and Post-Hubs Program Participation



[4] While this study reports on ED Data form Horizon Health Network (one of NB's two Regional Health Authorities), it does not include data from Vitalité Health Network. Therefore, the ED rates of families with children aged 2-4 across NB presented in Figure 4 may not be comprehensive.

Multivariate Logistic Regression Results

This section provides a brief overview of findings from the multivariate logistic regression models introduced in the Methodology. The full results of all three models can be viewed in Appendix 3.

Model 1 – GSJ Early Childhood Hubs Participation
The results of Model 1, which models participation in the Hubs program, appears first in Appendix 3. The indicator for ED visits is a statistically significant predictor of Hubs program participation at a 0.05 significance level (which is used for all statistical analyses in this report).

The positive coefficient associated with the variable indicates that having an ED visit is tied to an increased probability in being a Hubs program participant. Among the confounding variables, immigration status and age are the only ones found to be statistically significant – meaning that individuals are deemed more likely to be a participant in the Hubs program if they are an immigrant and if they are aged 3 or 4 (as compared to age 2).

Model 2 – ED Visits After GSJ Early Childhood Hubs Preschool Program Participation
The objective of the second multivariate logistic regression was to determine the statistical significance of Hubs program participation on ED visits in the nine-month window after the program ended. The results indicate that program participants have a higher probability of having an ED visit after being in the program. For perspective, a higher percentage of Hubs program participants also visit the ED before being in the program as well. The pertinent issue is whether attending the program had any causal effect on ED usage, or if the correlation can be attributed to other factors.

It is reasonable to hypothesize that program participants have less access to general practitioners than the subgroup of similarly aged children in NB due to the higher proportion of immigrants in the treatment group, which might prompt higher ED use. However, this hypothesis does not fully align with previous research conducted by NB-IRDT. A study on the health service use of newcomers to NB shows that recent immigrants make use of the ED at a lower rate than non-immigrants in NB when controlling for age (McDonald et al., 2024). Yet, recent immigrants are also shown to have the fewest visits to general practitioners and the most visits to walk-in clinics, suggesting possible barriers to accessing primary healthcare (McDonald et al., 2024).

In addition, Hubs program participants live in neighbourhoods with a much lower BTIPPE than the neighbourhoods of families across Saint John and NB, and income is considered one of the main social determinants of health and health inequity (Government of Canada, 2024).

Model 3 – Difference-in-Difference
Model 3 aimed to identify if there are any statistically significant differences in ED visitation rates by subgroup and time. The results show there is no increased likelihood of an ED visit for both the treatment and control group in the nine months before the Hubs program compared to the nine months after. However, program participants were more likely to have an ED visit overall. That said, the interaction variable – which measures whether program participation affected the change in ED visits over time – suggests the program itself did not cause this increase.

Conclusion

The objective of this study was to analyze the demographic and socioeconomic composition and access to social supports among children and families who participated in the Greater Saint John (GSJ) Early Childhood Hubs preschool program ("the Hubs program") across the 2021-2022 and 2022-2023 school years.

Using linked administrative data sets housed in NB-IRDT's trusted research environment and participant data provided by the YMCA, it used two approaches to better understand the characteristics, needs and challenges of Hubs program participants, including those likely to become participants in future.

First, descriptive statistics were used to compare Hubs program participants (the treatment group) to three other groups of children: 1) a control group of children 'matched' to treatment group children based on similar demographic and socioeconomic characteristics, 2) the population of children aged 2-4 living in Saint John and 3) the wider population of children aged 2-4 living in NB.

Then, multivariate logistic regression models were used to explore the statistical relationships between several variables of interest, including likelihood of participating in the Hubs program as well as likelihood of having an ED visit before and/or after program participation.

Descriptive statistics reveal that only 36% of families who participate in the Hubs program are single parent/guardian households – which is lower than the proportion of single parent/guardian households across the Saint John and NB populations. In general, treatment group children also live in households with more people than the average for NB.

There is a higher proportion of permanent residents and temporary residents among the primary household contacts for treatment group children compared to the primary household children for children of similar ages in Saint John and NB.

The average before tax (BTIPPE) and after tax (ATIPPE) per-person neighbourhood incomes of Hubs program participants are considerably lower than the average neighbourhood incomes for Saint John and NB children of comparable ages. For instance, the average before tax neighbourhood income of NB children aged 2-4 is $47,100, compared to $26,400 for Hubs program participants.

Multivariate logistic regression modelling reveals that having an ED visit in the two years prior to starting the Hubs program is a statistically significant predictor of participation in the program. However, participation is shown to be a statistically significant predictor of having an ED visit nine months after the program has finished. That being said, difference-in-difference modelling did not conclude there was a statistically significant change in ED visitation rates before and after the program for participants.

With immigration being a statistically significant predictor of participation in the Hubs program, there may be a need for services that support immigrant families' needs – such as translation and information sessions about adjusting to life in Canada.

In addition to childcare, the Hubs can also offer community supports and connections. Such services could include helping immigrant families learn about local resources (i.e., recreation programs, language supports) and sharing information about primary and preventive healthcare services available to families that could lower the need to visit the ED.

Looking Forward

These results can be leveraged to inform Hubs program planning moving forward. For instance, since results confirm that immigrants are making use of the program, it could continue to act as a bridge for new arrivals to Saint John.

The two school years' worth of data analyzed in this report show that Hubs program spots are disproportionately occupied by children from low-income neighborhoods and children of immigrants. As such, the program successfully provided daycare services to community members that need support.

There are many ways to explore more program benefits. The ED-related models in this report act as stand-ins for measuring access to social supports. These results could be strengthened by adding more comparisons before and after participating in the Hubs preschool program.

For instance, the Early Years Evaluation – Direct Assessment data set, which is available at NB-IRDT, was considered as one option to measure the development of children before their involvement with the Hubs program began, but participants could not be found in the data set because the data are currently only available until 2019. It must also be mentioned that bias exists in the collection of voluntary assessments like the Early Years Evaluation and the Healthy Toddler Assessment. As seen in the Descriptive Statistics section of this report, the proportion of children aged 2-4 receiving the Healthy Toddler Assessment is lower in Saint John than in New Brunswick as a whole.

Considering changes in socioeconomic circumstances would provide another potential avenue for evaluating the effects of the Hubs program. Preschool programs may allow parents to enter the workforce or increase their number of working hours. Access to childcare can also help parents or guardians pursue job training or attend classes while their child is in care. A difference-in-difference model that incorporates parents' or guardians' earnings before and after their child has been in the Hubs program could capture these benefits.

Limited access to recent data created some study limitations. As time passes, data from future Hubs program years will offer more opportunities for analysis. Continued tracking of Hubs program participants in each school year would grow the sample size of participants, which would be the best means of improving any future reporting.

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Appendix 1 – Single Parent/Guardian Households

Table A1: Percentage of Single Parent/Guardian Households (NB-IRDT Citizen Data)

Households (%)	Treatment	Control	Saint John	NB
Households With at Least One Child Aged 2-4	36.36	49.61	47.65	46.1
Households With Children of All Ages	-	-	-	45.0

Table A2: Percentage of Single Parent Households (Statistics Canada 2021 Census Data)

Households (%)	NB
Households With Children of All Ages	16.4

As mentioned in the Descriptive Statistics section, NB-IRDT data holdings show that the percentage of single parent/guardian households with at least one child aged 2-4 in NB is 46%. This finding is higher than the overall percentage of NB single parent households reported in the 2021 Census results (16%), and the variance can be better understood by considering methodological differences primarily related to the granularity of the Census definitions.

The methodology used in this report does not differentiate types of relations between adults and children in the same household. This report defines a single parent/guardian household as a household with only one adult and at least one child because there is no way of determining whether adults in households with children are parents based on records available in the Citizen Data. Adults in the household could be grandparents or older siblings, but they are assumed to be parents/guardians for the purposes of this report. The 2021 Census, however, can differentiate between parents, stepparents and other relations.

It should be noted that the 2021 Census finding for the percentage of single parent households in NB (16%) refers to households with children of all ages, not just children aged 2-4 (StatCan, 2022). For comparison, using the Citizen Data, 45% of households would be considered single parent/guardian households when children of all ages are included.

The 2016 Census shows that 62% of children between the ages of 0 and 14 in NB lived in a household with both birth parents (StatCan, 2024). In the Citizen Data, households are grouped together with a variable based on their household contact, and it is possible that this variable is not updated frequently enough to capture changes in living situations. The 45% figure taken from the Citizen Data (Table A1) represents the number of households that do not have both birth parents living there (meaning that roughly 55% would have both parents in the household – a number not too far from the 2016 Census result of 62%).

Appendix 2 – Statistical Matching

The control group used in this study was generated using statistical matching. The objective of the procedure was to find the children aged 2 to 4 in Saint John most similar to the treatment group. The matching was performed only for children meeting these two criteria (age and location) since it was important to ensure the control group children would also have opportunities to attend the Hubs program.

The matching process used a ratio of 4:1 for control-to-treatment with a function in the statistical programming language R called "MatchIt" (Ho et al., 2011). The function calculated logistic regression propensity scores for each observation and then found nearest neighbours for each treatment in the creation of the control group.

The propensity scores were calculated using the following formulation:

$$log\frac{P(InProgram_i)}{1-P(InProgram_i)} = \beta_0 + \beta_1 PeopleInHome_i + \beta_2 Age_i + \beta_3 Sex_i + \beta_4 BTIPPE_i + \varepsilon_i$$

where for observation *i*,

- **P(InProgram)** is the probability of being in the Hubs program.
- **PeopleInHome** is a categorical variable describing the number of people in the home of the child.
- **Age** is a continuous variable measured in months.
- **Sex** is a binary categorical variable coded as "0" for male and "1" for female.
- **BTIPPE** is a continuous variable measuring the before tax income per person equivalent of the child's Dissemination Area.

The coefficients associated with each covariate are $\beta_0, \beta_1, \beta_2, \beta_3$ and β_4. The error term of observation *i* is given by ε_i.

Appendix 3 – Multivariate Logistic Regression

An assortment of dependent variables across three multivariate logistic regressions was used to model independent binary outcome variables for treatment and control groups. Supposing a model had *n* covariates as predictors, models took on the general formulation of:

$$log\frac{P(y)}{1-P(y)} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_{n-1} x_{n-1} + \beta_n x_n$$

- $log\frac{P(y)}{1-P(y)}$ is the logit function with the probability of treatment given by **P(y).**
- β_0 is an intercept, and $\beta_1, \beta_2, \ldots \beta_{n-1}, \beta_n$ are the coefficients of a set of covariates $x_1, x_2, \ldots x_{n-1}, x_n$.

The models were made up of observations from 355 children – 71 treatments and 284 controls found through propensity score matching.

Model 1 – GSJ Early Childhood Hubs Program Participation

The first multivariate logistic regression used the 2021-2022 and 2022-2023 Hubs program participant data sets to model the probability of a child entering the program. Only data from before participants joined the Hubs program were used as independent variables. The formulation worked as follows:

$$log\frac{P(InProgram_i)}{1-P(InProgram_i)} = \beta_0 + \beta_1 EDVisit_i + \beta_2 Hospitalization_i + \beta_3 PeopleInHome_i + \beta_4 Age_i + \beta_5 Sex_i + \beta_6 BTIPPE_i + \beta_7 ImmStatus_i + \varepsilon_i$$

where for observation *i*,

- $log\frac{P(InProgram_i)}{1-P(InProgram_i)}$ is the logit function with the probability of joining the Hubs program given by **P(InProgram).**
- **EDVisit** is a binary variable, coded as "0" if the child did not go to an Emergency Department during the two years before starting the program, and "1" if they did.
- **Hospitalization** is a binary variable, coded as "0" if the child did not require hospitalization during the two years before starting the program, and "1" if they did.
- **PeopleInHome** is a categorical variable describing the number of people in the home of the child.
- **Age** is a categorical variable measured in years.
- **Sex** is a categorical variable coded as "0" for male and "1" for female.
- **BTIPPE** is a continuous variable measuring the before tax income per person equivalent of the child's Dissemination Area.
- **ImmStatus** is a categorical variable coded as "0" if they did not appear in the Transition Database or Permanent Resident Database, and "1" if they did.

Inference results for the covariates of the model are presented in Table A3. The statistical significance of covariates is denoted in the "P-Value" column for those that meet thresholds. For categorical covariates, coefficients are measured relative to a baseline level. For example, for the categorical variable "Visited ED within 2 years before program starting," the p-value indicates that those who had an ED visit ("Yes") are relatively more likely to be associated with preschool program participation than those who did not have an ED visit ("No").

Table A3: Multivariate Logistic Regression Covariates for Hubs Program Participation

Covariate	Coefficient	Std. Error	Z-Value	P-Value
Intercept	-0.3469	1.054	-3.290	0.00100 **
Categorical Variable: Visited ED within 2 years before program starting. Baseline = No				
Yes	1.352	0.3356	4.028	0.0000562 ***
Categorical Variable: Hospitalized within 2 years before program starting. Baseline = No				
Yes	-0.3179	0.4880	-0.651	0.51479
Categorical Variable: Sex. Baseline = Male				
Female	0.03886	0.2882	0.135	0.89275
Continuous Variable: BTIPPE				
BTIPPE	-0.0000004952	0.00001600	-0.031	0.97530
Categorical Variable: Immigrant. Baseline = no				
Yes	0.9123	0.3488	2.615	0.00892 **
Categorical Variable: Number of People in Household.[a] Baseline = 2				
3	-0.2229	0.6548	-0.340	0.73349
4	-0.4723	0.6744	-0.700	0.48378
5	-0.3159	0.6681	-0.473	0.63634
6	-0.2017	0.7214	-0.280	0.77978
7	-1.013	1.042	-0.972	0.33100
8	-0.2783	0.9854	-0.282	0.77760
9	-0.1881	1.085	-0.173	0.86234
Categorical Variable: Age During Program. Baseline = 2				
3	2.334	0.7941	2.939	0.00329 **
4	1.787	0.7878	2.268	0.02332 *

*Significance codes: '***' p-value <= 0.001; '**' p-value <= 0.01; '*' p-value <= 0.05; '.' p-value <= 0.1; ' ' p-value <= 1.*

[a] It is important to note that this categorical variable refers to the number of all individuals in the household: it does not distinguish between the number of children and the number of adults, nor does it show members' relations to one another (i.e., parent, grandparent, legal guardian, etc.). As such, results presented for larger households could reflect families with multiple children, or they could reflect alternative types of households, such as group homes or multi-family residences.

Model 2 – ED Visits After GSJ Early Childhood Hubs Program Participation

The next model was another multivariate logistic regression to establish whether being in the Hubs program was a significant predictor of an Emergency Room visit in the nine months after the conclusion of the program.

For the multivariate logistic regression, *t=1* represented the two years before Hubs program participation, and *t*=2 represented the nine months after the conclusion of the Hubs program.

The model took the form:

$$\boldsymbol{log\frac{P(ERVisit_{i,t=2})}{1-P(ERVisit_{i,t=2})} = \beta_0 + \beta_1 InProgram_i + \beta_2 EDVisit_{i,t=1} + \beta_3 PeopleInHome_i + \beta_4 Hospitalization_{i,t=1} + \beta_5 Age_i + \beta_6 Sex_i + \beta_7 BTIPPE_i + \beta_8 ImmStatus_i + \varepsilon_i}$$

where for observation *i* at time *t*,

- $\boldsymbol{log\frac{P(EDVisit)}{1-P(EDVisit)}}$ is the logit function with the probability of an ED visit given by **P(EDVisit).**

- **InProgram** is a binary variable coded as "0" if the child was not in the Hubs program and "1" if they were.

All other variables are retained from Model 1. The inference results of the model can be seen in Table A4 below.

Table A4: Multivariate Logistic Regression Covariates for ED Visits After Hubs Program Period

Covariate	Coefficient	Std. Error	Z-Value	P-Value
Intercept	-1.911	0.8623	-2.217	0.0266 *
Categorical Covariate: Participation in Hubs Preschool Program. Baseline = No				
Yes	0.8073	0.3248	2.485	0.0129 *
Categorical Variable: Visited ED within 2 years before program starting. Baseline = No				
Yes	0.3771	0.3447	1.094	0.2740
Categorical Variable: Hospitalized within 2 years before program starting. Baseline = No				
Yes	0.6324	0.4090	1.546	0.1220
Categorical Variable: Sex. Baseline = Male				
Female	-0.1973	0.2853	-0.692	0.4892
Continuous Variable: BTIPPE				
BTIPPE	-0.000004658	0.00001555	-0.300	0.7645
Categorical Variable: Immigrant. Baseline = No				
Yes	-0.1055	0.3800	-0.278	0.7814
Categorical Variable: Number of People in Household.[a] Baseline = 2				
3	0.1309	0.5931	0.221	0.8252
4	0.1189	0.6028	0.197	0.8436
5	-0.6190	0.6350	-0.975	0.3296
6	-0.3787	0.6915	-0.548	0.5839
7	-0.5842	1.026	-0.569	0.5693
8	-0.9901	1.236	-0.801	0.4230
9	0.4079	1.061	0.384	0.7006
Categorical Variable: Age During Program. Baseline = 2				
3	0.4088	0.6135	0.666	0.5051
4	0.7608	0.5843	1.302	0.1929

*Significance codes: '***' p-value <= 0.001; '**' p-value <= 0.01; '*' p-value <= 0.05; '.' p-value <= 0.1; ' ' p-value <= 1.*

[a] It is important to note that this categorical variable refers to the number of all individuals in the household: it does not distinguish between the number of children and the number of adults, nor does it show members' relations to one another (i.e., parent, grandparent, legal guardian, etc.). As such, results presented for larger households could reflect families with multiple children, or they could reflect alternative types of households, such as group homes or multi-family residences.

Model 3 – Difference-in-Difference

In Model 3, a comparison between the control and treatment groups was undertaken for ED visits before and after the start of Hubs program participation.

For the difference-in-difference multivariate regression, let *t=1* represent the nine months before program commencement (pre-treatment period) and *t=2* represent the nine months after its conclusion (post-treatment period).

Furthermore, let:

$$log\frac{P(EDVisit_{i,t})}{1-P(EDVisit_{i,t})} = \beta_0 + \beta_1 Post_i + \beta_2 Group_i + \beta_3(Post_i * Group_i) + \beta_4 Age_i + \beta_5 Sex_i + \beta_6 PeopleInHome_i + \beta_7 ImmStatus_i + \beta_8 BTIPPE_i + \varepsilon_i$$

where for observation *i*,

- **Post** is a binary variable, coded as "0" for pre-treatment period and "1" for post-treatment period.

- **Group** is a binary variable, coded as "0" for non-treatment group and "1" for the Hubs treatment group.

Other variables from Model 1 and Model 2 are carried over. The results of the model can be seen in Table A5 below.

Table A5: Difference-in-Difference Multivariate Logistic Regression Covariates for ED Visits

Covariate	Coefficient	Std. Error	Z-Value	P-Value
Intercept	-1.801	0.6204	-2.902	0.00371 **
Categorical Variable: Treatment period (before/after Hubs program). Baseline: Pre-treatment				
Post-treatment	0.2689	0.2327	1.155	0.24790
Categorical Variable: Group. Baseline = Non-treatment Group				
Treatment group	0.8563	0.3302	2.593	0.00951 **
Categorical Variable: Sex. Baseline = Male				
Female	-0.06815	0.2040	-0.334	0.73830
Continuous Variable: BTIPPE				
BTIPPE	-0.000001391	0.00001112	-0.125	0.90049
Categorical Variable: Immigrant. Baseline = No				
Yes	-0.4406	0.2770	-1.591	0.11164
Categorical Variable: Number of People in Household.[a] Baseline = 2				
3	0.1771	0.4723	0.375	0.70767
4	0.4692	0.4736	0.991	0.32178
5	-0.1185	0.4900	-0.242	0.80890
6	0.2466	0.5248	0.470	0.63851
7	0.6526	0.7049	0.926	0.35456
8	0.06807	0.7978	0.085	0.93200
9	0.02034	0.9198	0.022	0.98236
Categorical Variable: Age During Program. Baseline = 2				
3	-0.3287	0.3840	-0.856	0.39205
4	0.05254	0.3580	0.147	0.88332
Categorical Variable: Changes in subgroup and time				
TimeXGroup	0.08257	0.4425	0.187	0.85196

*Significance codes: '***' p-value <= 0.001; '**' p-value <= 0.01; '*' p-value <= 0.05; '.' p-value <= 0.1; ' ' p-value <= 1.*

[a] It is important to note that this categorical variable refers to the number of all individuals in the household: it does not distinguish between the number of children and the number of adults, nor does it show members' relations to one another (i.e., parent, grandparent, legal guardian, etc.). As such, results presented for larger households could reflect families with multiple children, or they could reflect alternative types of households, such as group homes or multi-family residences.