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# LONG-RUN EFFECTS FROM COMPREHENSIVE STUDENT SUPPORT: EVIDENCE FROM PATHWAYS TO EDUCATION

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## ABSTRACT

We estimate long-run impacts to the Pathways to Education program, a comprehensive set of coaching, tutoring, group activities and financial incentives offered to disadvantaged students beginning in Grade 9. High school administrative records are matched to income tax records to follow individuals up to the age of 28, even when they leave the household or province. We find significant positive effects on persistence in postsecondary education institutions, earnings and employment. Program eligibility increased adult annual earnings by 19 percent, employment by 14 percent and reduced social assistance (welfare) receipt by more than a third.



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An online appendix is available at http://www.nber.org/data-appendix/w25630

## 1. Introduction

Children that grow up surrounded by poverty often remain in poverty even into adulthood (Chetty et al., 2014). To try to break this cycle, governments and nonprofit institutions have developed a broad range of policies and interventions. These include: home visitations to disadvantaged parents with young children (Schweinhart et al., 2005; Heckman, Pinto and Savelyev, 2013; Conti, Heckman and Pinto, 2016; García et al., 2017; García, Heckman and Ziff, 2017), assistance to move to better neighborhoods (Katz, Liebman and Kling, 2001; Ludwig et al., 2013; Chetty, Hendren and Katz, 2016; Chetty and Hendren, 2017), reforms to school accountability and teacher pay (Goodman and Turner, 2013; Gilraine, 2018), lowering class sizes (Chetty et al., 2011), expanding effective charter schools (Abdulkadirogulu et al., 2011; Dobbie and Fryer, 2011, 2013; Fryer, 2014) and providing subsidies for higher education (Conger and Turner, 2017; Denning, Marx and Turner, 2018).

Recent evidence indicates particular promise from offering more structure and comprehensive education support programs to disadvantaged students. A randomized trial in Chicago, for example, tested a program that provided disadvantaged high school students regular social-cognitive skill training and mandatory daily tutoring during school and found dramatically improved math performance and school engagement (Cook et al., 2014; Heller et al., 2017). Another randomized trial testing a program that offered a wide array of social, community, and educational after-school services to disadvantaged high school students found large improvements to graduation rates and college enrollment (Rodríguez-Planas, 2012, 2017). At the college level, one of the most effective programs ever tested has been the Accelerated Study in Associate Program (ASAP), which requires that college students enroll full-time, attend mandatory tutoring,

regular counseling and career advising services, and receive free public transportation passes and funding for textbooks. ASAP doubled graduation rates at the City University of New York and had similarly large impacts on persistence from a replication attempt in Ohio (Scrivener et al., 2015; Sommo and Ratledge, 2016). The Carolina Covenant aid program is another college-based support system, where eligible students received financial aid (through a mix of grants and work study funding) and a variety of services including career exploration workshops, peer mentoring and support with navigating the university's wellness and academic programs. Clothfelter, Hemelt and Ladd (2018) find that eligibility increased credit accumulation through the first three years of college and suggestive evidence points to positive impacts on graduation rates.[1]

The Pathways to Education program (often referred to simply as Pathways) resembles ASAP and Carolina Covenant but at the high school level, offering disadvantaged youth in Grades 9 through 12 free public transportation and postsecondary financial aid in exchange for commitments to regularly meet with an advisor, access tutoring assistance, and attend character-building group events. Pathways began in 2001 as a grassroots effort by social workers at the community health center in the Regent Park public housing project in Toronto. Regent Park is Canada's oldest and largest public housing project and is one of the poorest communities in Toronto. Eligibility is based solely on placed of residence; for example, at its Regent Park site, only students living in the neighborhood's public housing units are eligible for the program. In previous work, we estimated that the introduction of Pathways increased high school graduation and college enrollment by about 10 to 20 percentage points (Oreopoulos, Brown, and Lavecchia, 2017).

[1] Page et al. (2017) estimate the impact of the Dell Scholars program on postsecondary completion. Using two identifications strategies, they find evidence that eligibility for the program increases the likelihood of receiving a bachelor's degree for low-income students.

Programs like Pathways and ASAP appear effective at improving education attainment, but cost thousands of dollars per student. To justify these costs, it is necessary to consider long-term benefits. What policy makers are ultimately concerned with is return on investment in improving lifetime outcomes, such as earnings, in order to break the cycle of poverty. With the possibility that short-run impacts on academic outcomes may not easily translate to significant long-term impacts (Demming, 2009; Chetty et al., 2011), the ability for comprehensive programs to improve long-run outcomes is an open question.

This paper delivers encouraging evidence that comprehensive student support programs like Pathways, can indeed lead to meaningful, long-run labor market benefits, including higher employment rates and earnings and a reduced reliance on social assistance (welfare). We exploit the lottery nature of being assigned to a particular public housing project (which also determines Pathways eligibility) and unique administrative data that links school records, personal income tax files and information from employers. Our data allow us to follow those eligible for Pathways and a comparison group of students living in other public housing units from the year they begin high school, through college and early into early adulthood. Using a quasi-random-assignment and difference-in-differences research design, we find that eligibility for Pathways increases postsecondary education attainment and the earnings of young adults. Between the ages of 19 and 24, eligibility for Pathways increases annual tuition expenditures at 2-year colleges and 4-year universities by between $229 and $760 or 30 to 100 percent. Consistent with a delayed labor market entry due to staying in school longer, eligibility for Pathways leads to lower adult earnings from age 19 to 23, but higher earnings from age 26 to 28. We estimate that by age 28, eligibility for Pathways increases earnings by about $3,100 per-year (2015 Canadian dollars) or 19 percent and the likelihood of being employed by 6-7 percentage points or 10-13 percent.

We find that Pathways has an impact on a variety of other monetary and non-monetary outcomes. Eligibility reduces social assistance receipts by $300-$500 (30-50 percent) and reduces the likelihood of having a child as a young adult by a third (32.3 versus 49.7 percent). These findings suggest that the large costs from offering an envelope of comprehensive services to disadvantaged youth at the high school level may nevertheless be worth it due to impressive long-run gains.

The remainder of the paper is structured as follows. Section 2 describes the main features of the Pathways to Education program. In Section 3, we describe the administrative datasets and empirical strategy. Sections 4 and 5 report the main results and various sensitivity checks. Section 6 provides some concluding comments.

## 2. Background on the Pathways Program

Pathways to Education is a non-profit organization that delivers a comprehensive program to support at-risk youth.[2] The program began in 2001 as a grass-roots effort by community workers in Regent Park, Toronto. In the City of Toronto, social housing is the responsibility of the Toronto Community Housing Corporation (TCH). The TCH operates high-rise apartment, single family and mixed housing units in 106 neighborhoods. TCH residents pay rent geared to income with payments are capped at 30 percent of gross income.

The Regent Park public housing project comprises more than 2,000 apartment units within a self-contained downtown community. The community has historically faced high levels of

[2] The discussion in this section borrows heavily from Section 2 of Oreopoulos, Brown and Lavecchia (2017).

poverty and crime. Around the time of the introduction of Pathways, fewer than 50 percent of Regent Park youth graduated high school and more than half of households had no earnings.

The Pathways program in Regent Park is available to all students living within the community's catchment area and attending high school. Eligibility for the program was phased in for successive cohorts, beginning with the entering Grade 9 cohort in September 2001. The fact that older Regent Park cohorts were never eligible for the Program – even Grade 9 students in September 2000 -- allows us to evaluate the impact of Pathways using a difference-in-differences design, described in Section 3. Over the past decade and a half, Pathways has expanded to 20 sites across 8 provinces Canada, including three additional sites in Toronto.[3]

Although Pathways is available to all high school students living in Regent Park, participation is voluntary and requires students and parents to agree each year in writing to the program's conditions and high expectations. Participation is nevertheless extremely high, often in excess of 85-90 percent (Oreopoulos, Brown and Lavecchia, 2017). Perhaps the community-based nature of the program contributes to this critical mass of interest and fosters near-complete buy-in from eligible families.

Pathways is defined by four pillars of support: counseling, financial, academic and social. Upon enrolling in the program, each student is assigned to a student-parent support worker (or SPSW) that is employed-full time by Pathways. Students meet with their SPSW at least twice a month, more if necessary, to discuss their participation in the program, attendance in school, academic performance, college applications, job search and any other issues that may arise. In later grades, SPSWs help with resume preparation, job interview practice and organizing visits with

[3] An up to date list of all Pathways sites is available at: https://www.pathwaystoeducation.ca/pathways-communities.

postsecondary institutions and potential employers. SPSWs also act as the point of contact for parents and schools.

Financial support for Pathways students comes in two forms. Immediate assistance and incentives for attending school takes the form of free public transportation tickets and school supplies that are distributed during student-SPSW meetings. Long-term financial assistance is provided through a trust fund for each participant. For each year a student is registered, the program sets aside $1,000 CAD, up to a maximum of $4,000 (tax-free), that can be used towards tuition and other post-secondary expenses. This bursary covered approximately 15-20 percent (33 percent) of the tuition for one academic year at four-year universities (two-year colleges) in Ontario over the 2006-2014 period.

The third pillar of the Pathways program, academic support, is comprised of free tutoring. Tutoring sessions are conducted in small groups or on a one-on-one basis if necessary. Pathways tutors are volunteers that receive some training from the organization and teach about five hours per week. Tutoring support is available in core academic subjects up to four nights a week and is mandatory for students with a GPA below a threshold (usually 65 percent).

The fourth pillar of the Pathways program is social support. In grades 9 and 10, this support takes the form of group mentoring activities. Students select at least two activities per month from a list of daily options provided by the program. In recent years, these activities have included: attending sporting events, theater, participating in creative arts programs, cooking, community recycling projects and martial arts. The activities are designed to develop students' social and group work skills, as well as to foster friendships among program participants. The typical mentoring group activity features 15 students and three volunteer mentors. Pathways allows students to take a more active role in selecting mentoring activities as they progress through high

school. In grades 11 and 12, students are able to propose biweekly activities to their SPSW that better align with their interests and skills, including tutoring younger grades.

## 3. Data and Empirical Strategy

### *3.1 Data*

We merged administrative data from Toronto Community Housing (TCH), the Toronto District School Board (TDSB), and Statistics Canada. In this section, we summarize this process and the construction of key variables. Online Appendix A contains additional details. TDSB administrative data are available for students who entered grade 9 beginning in September 2000, the year before Pathways was introduced. We also used data for a smaller cohort of students that enrolled in Grade 9 in September 1999 in the former City of Toronto before the city was amalgamated in 1998 to include the suburbs of East York, Etobicoke, North York, Scarborough and York. This additional year was used to check the sensitivity of our results to having one pre-Pathways cohort in our baseline sample. The TDSB data were matched to TCH data using uniquely identifiable postal codes from school enrollment forms. This allowed us to construct a dataset of all students enrolled in TDSB schools and living in one of the 70 public housing projects built by TCH that only house families paying subsidized rents.[4]

That the application process for TCH housing units was centralized and the demand for units far exceeded supply is important for our empirical strategy. Applying for a TCH unit required filling out a standardized form that assessed an applicant's income and need for housing, as well

[4] We focus on the 70 TCH sites that exclusively house tenants paying rent geared to income; the remainder house a mix of families paying subsidized and market rent or seniors.

as broad geographic preferences. Because the number of applicants far exceeded the number of available units, offers were made based on a first-come, first-serve basis, with some preferential treatment for applicants that were survivors of domestic abuse and human trafficking, terminally ill applicants and over-housed tenants. Most applicants indicated they were interested in all TCH projects to reduce their waitlist time, which averaged around 5 years (Toronto Social Housing Connections, 1998). Consequently, where a TCH resident ended up was largely determined by the availability of units at the time they were at the top of the waiting list and, therefore, not only were the young adults in our sample very similar in terms of the circumstances that brought them to public housing as children, but assignment to Regent Park and eligibility for Pathways was similar to a lottery. It was unlikely that families would have known about the program and selected into Regent Park prior to the introduction of Pathways.

We matched the TDSB-TCH data to administrative data from Statistics Canada for the 2005-2015 years. These data offer rich information on Canadian tax filers' postsecondary enrollment and tuition expenditures, earnings, social assistance and UI receipt, as well as marital status and number of children. TDSB public housing students were matched to the administrative tax records using their first and last name and date of birth. Although individuals appear in the tax data as soon as they obtain a Social Insurance Number (SIN) and file a tax return, we restricted the analysis sample to those at least 19 years old in each calendar (tax) year. This leaves us with an unbalanced panel of 8,605 public housing students between 2005 and 2015 or 48,069 individual-year observations.

We estimated the causal effect of eligibility for Pathways on a variety of long-term outcomes, beginning with persistence in postsecondary education programs. The tax data contain information on the tuition payments made to recognized postsecondary institutions over a calendar

year (Canadian tax filers over the age of 16 may claim a nonrefundable tax credit for eligible tuition payments). We used these tuition payments to proxy for persistence in college or university. Our two primary labor market outcome variables were a dummy variable equal to one if an individual received positive employment earnings and zero otherwise and the total earnings over a calendar year.[5] Earnings for those not working were coded as zero. The data also contain information on social assistance payments received, unemployment insurance (UI) benefit payments, marital status and the number of children (both under the age of 6 and under the age of 18).[6] Background variables were constructed from both the TDSB and tax data and included gender, immigrant status, language spoken at home, age at the start of high school, and age in the current tax year.[7] We deflated all dollar amounts are to 2015 dollars using the Bank of Canada's Consumer Price Index.

### *3.2 Empirical Strategy*

Below we display estimates of the causal effect of eligibility for Pathways on long-term outcomes using a difference-in-differences approach, taking advantage of the program's gradual roll-out to successive Grade 9 students. Our research design compares the outcomes of individuals that were assigned to live in Regent Park during high school with students that were assigned to other Toronto public housing projects before and after Pathways was introduced. Since our data

[5] For individuals work worked for multiple employers, earnings are equal to the sum of the wages paid at all firms. Our measure of earnings also includes self-employment income.
[6] Unemployment insurance benefits in Canada are delivered through the Employment Insurance (EI) program.
[7] Online Appendix Table A2 reports summary statistics for select dependent and independent variables for the 2015 calendar year.

follows young adults from the time the leave high school until their late 20s, we are able to estimate heterogeneous impacts of Pathways by age. Our main estimating equation is

$$y_{i(pc)a} = \sum_{a=20}^{29} \gamma^a 1\left[Age_{i(pc)a} = a\right] + \sum_{a=20}^{28} \beta^a T_{i(pc)} 1\left[Age_{i(pc)a} = a\right] + X'_{i(pc)}\delta + e_p + e_c + e_{i(pc)a} \quad (1)$$

where the subscript *i* denotes an individual, *a* denotes calendar age (in years), *p* denotes housing project and *c* denotes cohort (the year entered grade 9). The variable $1[Age_{i(pc)a} = a]$ is equal to one if individual *i* is age *a* in year *t* and zero otherwise (the omitted age dummy is for 19 year-olds). The individual time invariant characteristics mentioned earlier are encapsulated by the vector $X'_{ipc}$, and $e_p$ and $e_c$ are housing project and year fixed effects, respectively. $T_{i(pc)}$ is a dummy variable equal to one for those that lived in Regent Park and entered Grade 9 after September 2001 (eligible for Pathways) and equal to zero otherwise. Standard errors are clustered at the housing project level to allow for serial correlation and heterogeneity in the outcomes of students that resided in the same housing project (Cameron and Miller, 2015).[8]

The coefficient $\beta^a$ is the average causal effect of being eligible for Pathways on outcome *y* at age *a*.[9] If eligibility for Pathways increases postsecondary persistence and delays labor market entry, we expect that the $\beta^a$ coefficients will be decreasing in age when postsecondary tuition

[8] As a sensitivity test, we also implement the effective degrees of freedom correction for the clustered robust variance estimator suggested by Young (2016). The results are reported in Appendix Table A14 and discussed in Online Appendix B. In general, the estimated standard errors using this procedure are larger than those reported in the main results.

[9] Since the registration rate for Pathways is extremely high (see Figure 1 in Oreopoulos, Brown and Lavecchia (2017)), the casual effects of participation in Pathways or treatment-on-the-treated (TOT) effects will be similar to the intent-to-treat (ITT) effects reported below.

expenditures is the dependent variable. We expect the opposite age pattern when earnings and labor supply variables are the dependent variables of interest. The identification of causal effects in our setting requires that the parallel trends assumption is satisfied: in the absence of the introduction Pathways, the average outcomes of young adults from Regent Park would have followed the same path as the other public housing (OPH) projects. We report a number of robustness checks in Section 4 and in the Online Appendix to assess the validity of this assumption.

Note that our estimate of the causal effect of eligibility for Pathways on earnings for young adults may understate the effect of the program on more mature workers. This is because a delayed labor market entry (due to increased schooling) will mean that Pathways-eligible individuals will have less labor market experience, on average, than their ineligible peers. Recent research suggests that the earnings-experience profile is steep for young workers in Canada (Mincer, 1974; Boudarbat, Lemieux and Riddell, 2010). This is important to keep in mind when interpreting the results in Section 4.

## 4. Results

### *4.1 Graphical Evidence*

Figure 1 illustrates our identification strategy for the main dependent variables of interest. The figure plots average tuition expenditures (Figure 1a), earnings (Figure 1b) and employment (Figure 1c) by year entered Grade 9 for the 2015 tax year. Recall that there exists an inverse relationship with an individual's Grade 9 year of entry and their age in 2015. The dark circle markers are the unconditional means for young adults that lived in Regent Park during high school and the diamond markers are the unconditional means for those that lived in OPH.

Figure 1a plots the relationship between average tuition expenditures and year of Grade 9 entry and reveals two clear patterns. The first is that tuition expenditures are much higher for younger cohorts (those who entered Grade 9 in 2005 or later) in both Regent Park and OPH. The second is that the tuition expenditures of young adults from Regent Park closely track those from OPH, except during the years immediately after high school when individuals are in their early 20s. In particular, the average tuition expenditures of young adults from Regent Park that entered Grade 9 in 2000, the year before Pathways was introduced, is similar to that of young adults from OPH. The same is true for the 2001-2004 Regent Park cohorts who are age 25 to 28 in 2015. However, young adults in the 2006-2008 Regent Park cohorts (age 21 to 23 in 2015) have much higher tuition expenditures, on average, than those that lived in OPH. For example, young adults in the 2006 Regent Park cohort claimed an average of $1,445 in tuition expenditures in 2015 compared with $918 for young adults from OPH.

If the parallel trends assumption holds, then the difference between the postsecondary tuition expenditures of young adults from Regent Park and OPH can be interpreted as the causal average effect of eligibility for Pathways at a particular age. Under this assumption, the means in Figure 1a suggest that eligibility for Pathways increases expenditures until about age 25 before tapering off.

Figure 1b plots the relationship between 2015 earnings and year of Grade 9 entry. The figure shows that the 2000 OPH cohort earned $18,000, on average, in 2015. Young adults in the same cohort that lived in Regent Park earned $2,400 more (or $20,400), an average, in 2015. The earnings gap between Regent Park and OPH young adults increases substantially in the subsequent cohorts, precisely when Pathways was introduced in Regent Park. The earnings difference between young adults that lived in Regent Park and the OPH sites ranges between $3,200 and $4,900 for

the 2001 to 2004 Grade 9 cohorts. For more recent cohorts, the earnings gap is small and sometimes negative. Overall, the raw data presented in Figures 1a and 1b suggest that eligibility for Pathways increases expenditures on tuition at postsecondary students for young adults under the age of 25 and increases earnings for those in their mid- to late 20s. This age pattern is consistent with a delayed labor market entry due to higher postsecondary education attainment.

Figure 1c shows that there is a similar age pattern for the employment status dummy as with earnings. The figure suggests that eligibility for Pathways increases the fraction of young adults in their mid- to late 20s that report positive earnings. Effects for more recent cohorts is mixed, perhaps because the employment rate for younger adults is more volatile, especially for the 2006-2008 cohorts.

### *4.2 Regression Analysis*

The means in Figure 1 illustrate our empirical strategy but are based on 2015 data only. In the remainder of the analysis, we pool data from 2005-2015 and estimate equation (1) on the sample of young adults that lived in public housing and entered Grade 9 between 2000 and 2006.[10] Table 1 reports estimated $\gamma^a$'s and $\beta^a$'s from equation (1) for our three main outcomes: tuition expenditures (column 1), earnings (column 2) and employment (column 3). The estimates in Table 1 confirm the graphical evidence in Figure 1. In particular, the estimate for $\beta^{19}$ in column 1 suggests that eligibility for Pathways increases tuition expenditure by a statistically insignificant $229 at age 19. Between the ages of 20 and 24, eligibility for Pathways is estimated to increase

[10] We restrict the sample to those that entered Grade 9 no later than 2006 to avoid contaminating the OPH comparison group with the Pathways expansion sites of Rexdale and Lawrence Heights, where Pathways was introduced on 2007.

tuition expenditures by between $360 and $760 per year. Each of the $\beta^{20} - \beta^{24}$ coefficient estimates is statistically significant at the one percent level. To put these numbers in perspective, the average tuition expenditure at age 19 for the 2000 OPH cohort is $730 (see online Appendix Table A3). Compared with this benchmark, eligibility for Pathways increases tuition expenditure claims by 49 to 104 percent between the ages of 19 and 24. Beginning at age 25, the estimated impact of Pathways on tuition expenditures falls dramatically.[11]

In previous work, we found that eligibility for Pathways increased high school graduation rates and the fraction of youth admitted to a college or university (Oreopoulos, Brown and Lavecchia, 2017). However, enrollment in a postsecondary institution does not guarantee success or graduation, especially for students from disadvantaged families that face additional pressures, such as financial constraints, work requirements and family obligations (Oreopoulos and Petronijevic, 2013; Scrivener et al., 2015). Although our administrative data does not have a direct measure of postsecondary education attainment, postsecondary tuition expenditure claims allow us to infer the number of (calendar) years a student attends a postsecondary institution. The estimates in column 1 of Table 1 suggest that eligibility for Pathways leads to higher expenditures at colleges and universities during the period of the lifecycle when most young adults invest in postsecondary education.

The dependent variable in column 2 of Table 1 is earnings from all employment activities. The $\gamma^a$ coefficient estimates follow the expected pattern: the earnings of young OPH adults increase by approximately $1,000 to $2,000 per year from age 19 to age 29. The $\beta^a$ estimates are also generally increasing in age. Eligibility for Pathways lowers earnings for young adults age 19-

[11] The $\beta^{28}$ coefficient estimate is suppressed because of data confidentiality concerns due to the fact that relatively few 28 year-olds in our sample are enrolled in college.

23 by between $800 and $1,700 per year. Beginning at age 24, the $\beta^a$ coefficients increase steadily and by age 26, eligibility for Pathways is estimated to have a positive effect on earnings. The $\beta^{28}$ coefficient estimate suggests that eligibility for Pathways increases earnings by $3,100 or 19 percent at age 28.[12] This estimate is statistically significant at the one percent level and is comparable to recent estimates of the return to an additional year of high school or postsecondary education (Oreopoulos and Petronijevic, 2013; Heckman, Humphries and Veramendi, 2018).

Unconditional earnings can increase because of an increase in the likelihood of working (extensive margin), an increase in earnings conditional on working (intensive margin), or both. In column 3, we explore the extent to which the effect of Pathways on earnings is due to an extensive margin response. Eligibility for Pathways has a small and statistically insignificant effect on working at age 19-20. By age 21, eligibility for Pathways is estimated to increase the likelihood of having positive earnings by 4.3 percentage points. This effect increases to between 5 and 8 percentage points for those between the ages of 23 and 28. Our estimate for $\beta^{28}$ suggests that eligibility for Pathways increases the likelihood of having positive earnings by 7.7 percentage points or 14 percent (0.077/0.550).

It is also possible that eligibility for Pathways increases earnings conditional on working. There are several possible channels through which this may occur. For example, the job search assistance provided by SPSWs may help match Pathways participants with better-paying firms. Another possibility is that Pathways increases human capital through more education, leading to higher earnings in adulthood. However, a naïve estimation of equation (1) on the sub-sample of individuals with positive earnings will lead to biased estimates of the $\beta^a$ coefficients because of

[12] Average (unconditional) earnings at age 28 for the 2000 OPH cohort is $16,390; $3,100/$16,900 = 0.189.

the significant extensive margin response. If young adults induced to work because of Pathways have a lower earnings potential, on average, than those that would have worked in the absence of the program, then conditioning on the sub-sample of those with positive earnings will result in estimates for $\beta^a$ that are biased downwards. In Online Appendix B1, we show that the extensive margin effect explains a majority (between 50 and 79 percent) of the impact of eligibility for Pathways on unconditional earnings.

### *4.3 Robustness Checks*

The validity of our difference-in-differences strategy requires that the counterfactual outcomes of youth that resided in Regent Park follow the same trend as those that resided in other TCH projects. With only one pre-Pathways cohort, we are unable to assess the plausibility of this assumption using our baseline sample of students that entered high school between September 2000 and 2006. In this subsection, we address this limitation in two ways. First, we report results from the estimation of equation (1) for subsamples of OPH sites that most closely resemble Regent Park in size and composition. Second, we use data for students that began high school in 1999 to assess whether the outcomes of pre-2001 Regent Park cohorts followed the same path as young adults from OPH. As mentioned earlier, this information is only available for students that lived in a select few public housing sites in the legacy Metro Toronto school board.[13]

[13] To increase sample size, the legacy Metro Toronto sample includes both uniquely matched postal codes for public housing projects as well as close-by mixed residences. Estimated effects from the sample of postal codes that match uniquely to public housing addresses only are similar but noisier.

Table 2 reports the estimation results from this sensitivity analysis for postsecondary tuition expenditures (Panel A, top) and earnings (Panel B, bottom). The results for the employment status dummy are reported in Online Appendix Table A6. Column 1 reports our baseline estimates from Table 1 as a benchmark. In column 2, the comparison group is restricted to the 11 largest pubic housing sites in Toronto. These sites house several hundred residents and face poverty rates similar to Regent Park. The age pattern of the $\beta^a$ coefficients is very similar to the baseline sample for both the postsecondary tuition and earnings outcomes. For example, the estimates for $\beta^{20}$ - $\beta^{23}$ in Panel A suggest that eligibility for Pathways increases postsecondary tuition expenditures by between $370 and $730 between the ages of 20 and 23. Furthermore, the estimates for $\beta^{26}$ - $\beta^{28}$ in Panel B suggest that eligibility for Pathways increases earnings by $1,450 to $3,850 for young adults in their late 20s. In column 3, the comparison group is restricted to youth that went to high school in one of Toronto's so-called "priority neighbourhoods", which are areas with concentrated levels of crime and poverty. The estimates for $\beta^a$ in this sub-sample are also very similar to those in columns 1 and 2.

Column 4 of Table 2 reports the estimates from equation (1) when the comparison group is restricted to the aforementioned public housing sites in the legacy Metro Toronto school board. The pattern of $\beta^a$ coefficients in Panel A are very similar in magnitude to the baseline specification in column 1. In particular, the estimates for $\beta^{20}$ - $\beta^{23}$suggest that eligibility for Pathways increases postsecondary tuition expenditures by between $240 and $690 for young adults in their early twenties. Compared with the baseline sample, restricting the sample to young adults from the legacy Metro Toronto school board leads to estimates that are more imprecise; the standard errors in column 1 are generally at least twice as large as those in column 1 and not all $\beta^a$coefficients estimates are statistically significant at conventional levels. This is because the sample size from

including an earlier cohort of students from a smaller set of projects falls by almost two thirds from 48,069 in column 1 to 16,969 in column 4.

Figure 2 plots the average earnings by year entered Grade 9 for Regent Park and the Metro legacy Toronto public housing sites for the 2015 calendar (tax) year. There appears to be no discernable difference in the trends of the pre-2001 Regent Park and legacy Metro Toronto public housing cohorts, suggesting that the parallel trends assumption underlying our empirical strategy is plausible. Furthermore, the estimates of the effect of eligibility for Pathways on earnings in Table 2 follow the same age pattern as in the baseline sample. Our estimates suggest that by ages 26-28, eligibility for Pathways increases annual earnings by at least $2,100-$5,400 or 12-32 percent. Together, the evidence in Table 2 points to large long-term earnings gains from eligibility for Pathways in Regent Park.

## 5. Additional Long-Term Outcomes

In Table 3, we report estimates of the effect of Pathways on additional outcomes. These results corroborate our earnings estimates and suggest that Pathways positively impacts certain social outcomes as well as labor market outcomes. In column 1, the dependent variable is social assistance (welfare) receipts. At all ages, young adults eligible for Pathways receive less social assistance receipt than those ineligible for the program. Our estimates suggest that by age 25-28, eligibility for Pathways reduces welfare payments by $300-500 per year or 30-54 percent. The estimated impacts on UI benefit receipt in column 2 is mixed. Eligibility for Pathways appears to increase UI receipts for older individuals in our sample. However, increased UI receipt may, in part, be due to increased eligibility for benefits because eligibility for UI in Canada depends on

satisfying a minimum hours of work requirement. Columns 3 and 4 of Table 2 show that eligibility for Pathways significantly reduces the likelihood of being married and having a child before age 28. In Online Appendix Tables A9 and A10, we show that eligibility for Pathways reduces the likelihood of having a child for women much more than for men. Finally, we estimate the impact of Pathways on job quality using the median earnings at the firm an individual works for as a proxy for firm quality.[14] Column 5 of Table 2 shows that eligibility for Pathways leads to better employment opportunities using this measure.

## 6. Discussion

In this paper, we evaluate the impact of the Pathways to Education program on the long-term outcomes of disadvantaged youth. Using unique administrative data from Statistics Canada, the Toronto District School Board (TDSB) and Toronto Community Housing (TCH) we estimate the effect of Pathways on earnings, employment, persistence in postsecondary institutions, as well as a variety of other labor market and social outcomes. Our findings extend our previous work in Oreopoulos, Brown and Lavecchia (2017) and show that, at its Regent Park site, the positive impacts from Pathways extend significantly beyond adolescence and into early adulthood. We find that eligibility for Pathways increases annual earnings at age 28 by approximately $3,100 or 19 percent. Eligibility for Pathways is also found to have a large positive impact on the fraction of disadvantaged youth that are employed as adults and postsecondary education attainment. The program also decreases the likelihood of receiving social assistance.

[14] For those who work at multiple firms in a tax year, we use the highest median earnings across all establishments.

Our paper is the first to estimate the impacts of comprehensive support programs for high school students on earnings. Our results add to a growing body of evidence that interventions like Pathways, ASAP, Carolina Covenant and the Quantum Opportunity Program have the potential to improve labor market outcomes and reduce reliance on social assistance more than a decade after students participate in the program (Scrivener et al., 2015; Heller et al., 2017; Rodriguez-Planas, 2017; Clotfelter, Hemelt and Ladd, 2018). An important question remains around whether watered-down versions of these programs could generate similar effects for less cost.[15] But equally interesting is the question of whether programs like Pathways at the high school and ASAP at the college level are substitutes or work even better when delivered together.

[15] Online Appendix C reports the results of a benefit-cost calculation using the individual and public monetary gains to Pathways using the estimates reported in the paper.

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**Figure 1A**

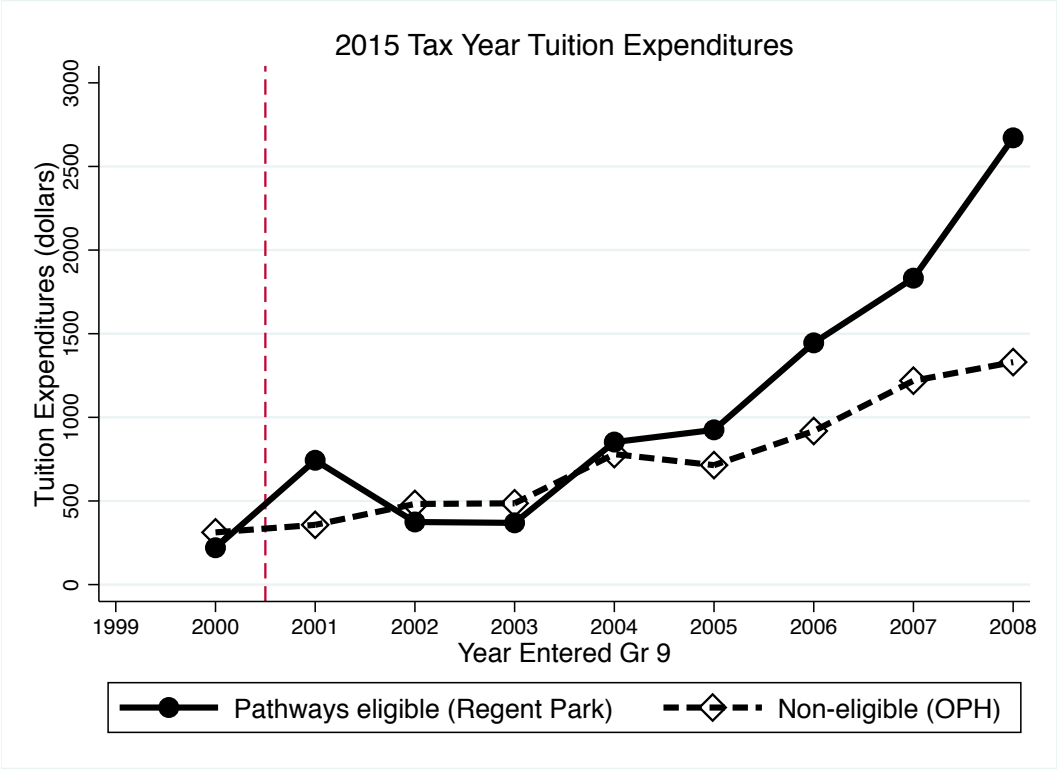



**Figure 1B**

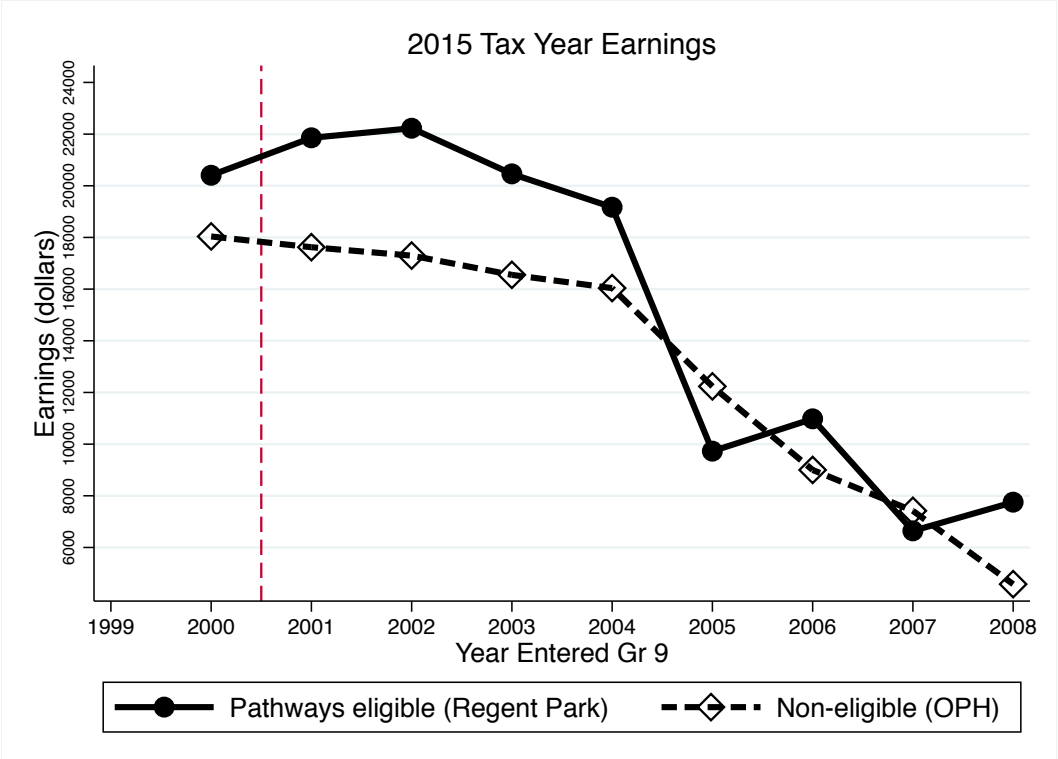
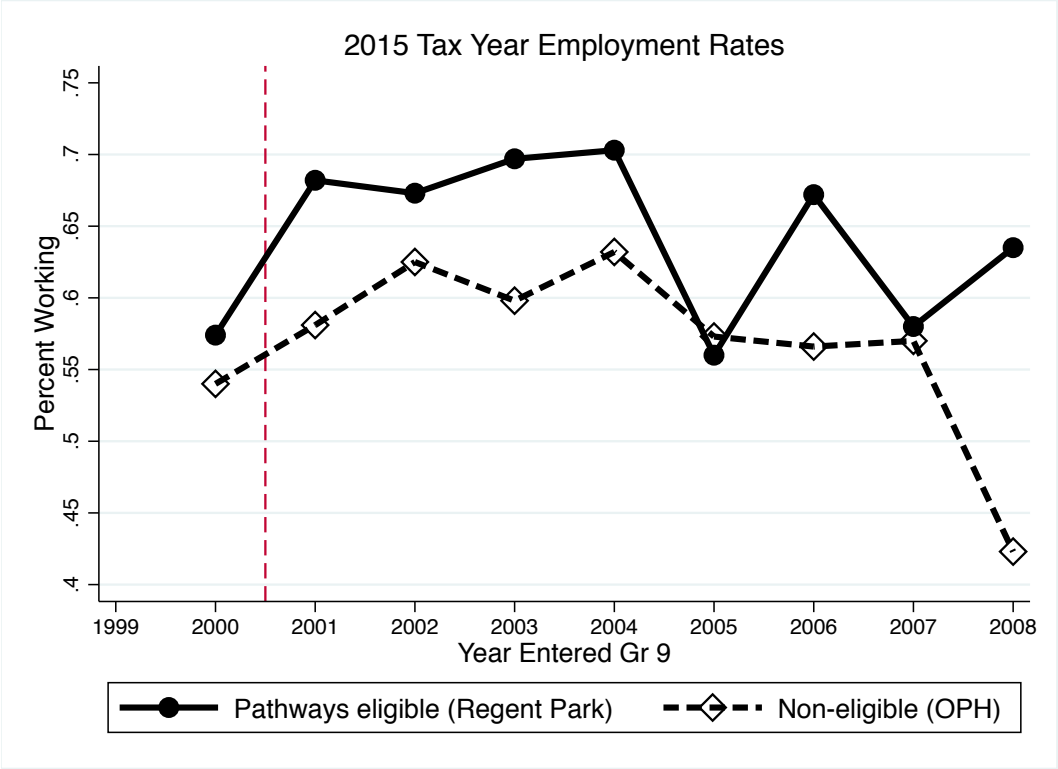
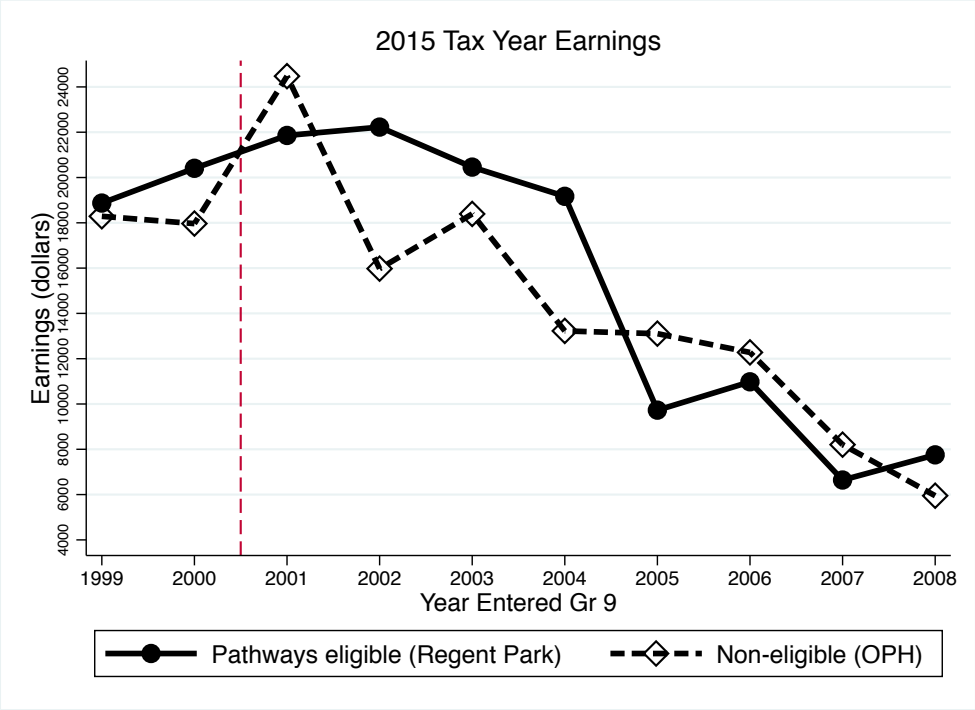


**Figure 1C**




Notes: Figure 1 plots average 2015 outcomes by year entered Grade 9 (cohort) for youth that lived in Regent Park in high school (solid) line and other Toronto public housing projects (OPH) (dashed line). In Figure 1A the outcome variable is expenditures on tuition at 2-year colleges and 4-year universities. In Figures 1B and 1C the outcome variable is labor market earnings (all sources) and employment status, respectively.

**Figure 2**
**2015 Outcomes by Grade 9 Cohort: Legacy Toronto Projects Comparison Group**




Notes: Figure 2 plots the average 2015 tax year earnings by year entered Grade 9 for the 1999-2008 TDSB cohorts. The means for young adults that lived in Regent Park are represented by the solid circle markers and the means for the legacy Metro Toronto public housing sites are represented by the open diamond markers.

**Table 1**
**Intent to Treat (ITT) Estimated Effects of Pathways on Adult Outcomes by Age**

| | (1) Tuition Expenditures | (2) Earnings | (3) Working |
|---|---|---|---|
| Pathways*Age 19 | 229 | -1,739 | 0.017 |
| | [228] | [463]*** | [0.020] |
| Pathways*Age 20 | 634 | -788 | 0.028 |
| | [70]*** | [519] | [0.020] |
| Pathways*Age 21 | 760 | -1,236 | 0.043 |
| | [67]*** | [482]** | [0.017]** |
| Pathways*Age 22 | 727 | -1,458 | 0.052 |
| | [61]*** | [504]*** | [0.017]*** |
| Pathways*Age 23 | 459 | -1,314 | 0.052 |
| | [53]*** | [517] | [0.017]*** |
| Pathways*Age 24 | 368 | 138 | 0.054 |
| | [50]*** | [472] | [0.016]*** |
| Pathways*Age 25 | -174 | -6 | 0.133 |
| | [57]*** | [551] | [0.018]*** |
| Pathways*Age 26 | -8 | 2,148 | 0.069 |
| | [67] | [518]*** | [0.017]*** |
| Pathways*Age 27 | -86 | 4,542 | 0.061 |
| | [95] | [772]*** | [0.031]** |
| Pathways*Age 28 | - | 3,136 | 0.077 |
| | - | [702]*** | [0.023]*** |
| Age 20 | 58 | 690 | 0.008 |
| | [181] | [195]*** | [0.012] |
| Age 21 | 106 | 1,960 | 0.019 |
| | [200] | [146]*** | [0.011]* |
| Age 22 | -26 | 3,556 | 0.021 |
| | [197] | [175]*** | [0.012]* |
| Age 23 | -262 | 5,803 | 0.024 |
| | [211] | [275]*** | [0.010]** |
| Age 24 | -476 | 7,359 | 0.015 |
| | [214]** | [287]*** | [0.013] |
| Age 25 | -563 | 9,217 | 0.013 |
| | [216]** | [347]*** | [0.012] |
| Age 26 | -668 | 10,805 | 0.008 |

| | | | |
|---|---|---|---|
| | [214]*** | [372]*** | [0.011] |
| Age 27 | -650 | 11,642 | 0.029 |
| | [212]*** | [672]*** | [0.027] |
| Age 28 | -691 | 13,255 | 0.014 |
| | [186]*** | [501]*** | [0.012] |
| Age 29 | -750 | 14,532 | 0.020 |
| | [177]*** | [576]*** | [0.012]* |
| Constant | 6,091 | 31,209 | 1.210 |
| | [698]*** | [7,336]*** | [0.293]*** |
| Observations | 48,069 | 48,069 | 48,069 |
| R-squared | 0.072 | 0.088 | 0.028 |

Notes: The sample is individuals (students) who entered a TDSB high school between 2000 and 2006, lived in a public housing project and are at least 19 years old between 2005 and 2015. Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for gender, immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with 70-1 = 69 degrees of freedom. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

**Table 2**
**ITT Estimated Effects for Pathways to Education Using Alternative Comparison Groups**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Baseline | Large Density Projects | Priority Neighbourhoods | Legacy Toronto Projects |
| *A. Tuition Expenditures* | | | | |
| Pathways*Age 19 | 229 | -62 | 543 | 663 |
| | [228] | [465] | [81]*** | [228]** |
| Pathways*Age 19 | 634 | 551 | 747 | 242 |
| | [70]*** | [118]*** | [97]*** | [356] |
| Pathways*Age 21 | 760 | 729 | 889 | 689 |
| | [67]*** | [107]*** | [103]*** | [242]** |
| Pathways*Age 22 | 727 | 636 | 828 | 633 |
| | [61]*** | [96]*** | [81]*** | [280]* |
| Pathways*Age 23 | 459 | 370 | 473 | 427 |
| | [53]*** | [61]*** | [90]*** | [188]* |
| Pathways*Age 24 | 368 | 398 | 509 | 313 |
| | [50]*** | [57]*** | [52]*** | [191] |
| Pathways*Age 25 | -174 | -215 | -159 | -126 |
| | [57]*** | [55]*** | [44]*** | [193] |
| Pathways*Age 26 | -8 | -156 | -45 | 130 |
| | [67] | [85]* | [72] | [203] |
| Pathways*Age 27 | -86 | -150 | -17 | 253 |
| | [95] | [144] | [80] | [176] |
| Pathways*Age 28 | - | - | - | - |
| | - | - | - | - |

*B. Earnings*

| | | | | |
|---|---|---|---|---|
| Pathways*Age 19 | -1,739 | -2,751 | -2,948 | -4,419 |
| | [463]*** | [717]*** | [639]*** | [1,580]** |
| Pathways*Age 20 | -788 | -1,462 | -2,127 | -1,363 |
| | [519] | [981] | [579]*** | [1,620] |
| Pathways*Age 21 | -1,236 | -2,002 | -2,598 | -1,736 |
| | [482]** | [806]** | [611]*** | [1,464] |
| Pathways*Age 22 | -1,458 | -2,414 | -2,793 | -1,713 |
| | [504]*** | [865]** | [689]*** | [1,719] |
| Pathways*Age 23 | -1,314 | -2,360 | -2,582 | -1,085 |
| | [517]** | [952]** | [1,055]** | [1,876] |
| Pathways**Age 24 | 138 | -427 | -403 | 628 |
| | [472] | [695] | [398] | [1,787] |
| Pathways*Age 25 | -6 | -431 | -426 | 599 |
| | [551] | [911] | [455] | [1,843] |
| Pathways*Age 26 | 2,148 | 1,468 | 1,889 | 2,767 |
| | [518]*** | [530]** | [562]*** | [1,471] |
| Pathways*Age 27 | 4,542 | 3,854 | 4,552 | 5,398 |
| | [772]*** | [799]*** | [803]*** | [1,829]** |
| Pathways*Age 28 | 3,136 | 2,320 | 3,090 | 2,114 |
| | [702]*** | [1,279]* | [741]*** | [2,562] |
| Observations | 48,069 | 24,446 | 20,335 | 16,969 |

Notes: The baseline sample is the same as in Table 1. Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. For column 2, the large density projects include: Alexandra Park, Bleecker Street, East Mall, Edgeley Village, Jane Finch, Firgrove Crescent, Flemingdon Park, Lawrence Heights, Malbern, Moss Park, Pelham Park, Regent Park, Rexdale (Thistletown) and Warden Woods. For column 3, the priority neighbourhoods are comprised of the following 11 housing projects: Duncanwoods Drive, Edgeley Village, Firgrove Crescent, Flemingdon Park, Lawrence Heights, McCowan Road, Pelham Park, Rexdale (Thistletown), Scarlettwoods, Yorkwoods Village, and 'Other' projects (several small projects grouped together to create a publicly available dataset). For column 4, the legacy Metro Toronto projects include: Alexandra Park, Blake Street, Bleecker Street, Don Mount Court, Edgewood Avenue, Greenwood Park, Pelham Park and Regent Park. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for gender, immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with G-1 degrees of freedom (G denotes number of housing projects). *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

**Table 3**
**Intent to Treat (ITT) Estimated Effects of Pathways on Additional Outcomes**

| | (1) Social Assistance Payments | (2) UI Benefit Payments | (3) Married or Common Law | (4) Has Child | (5) Employer Quality |
|---|---|---|---|---|---|
| Pathways*Age 19 | -89 | -1,587 | -0.036 | -0.055 | 3,487 |
| | [100] | [451]*** | [0.006]*** | [0.016]*** | [958]*** |
| Pathways*Age 20 | -112 | -785 | -0.031 | -0.071 | 3,847 |
| | [91] | [439]* | [0.007]*** | [0.017]*** | [919]*** |
| Pathways*Age 21 | -160 | -1,118 | -0.023 | -0.085 | 3,385 |
| | [89]* | [434]** | [0.007]*** | [0.014]*** | [777]*** |
| Pathways*Age 22 | -142 | -1,268 | -0.029 | -0.088 | 2,898 |
| | [94] | [467]*** | [0.007]*** | [0.015]*** | [803]*** |
| Pathways*Age 23 | -215 | -1,160 | -0.021 | -0.079 | 498 |
| | [91]** | [504]** | [0.006]*** | [0.017]*** | [1,294] |
| Pathways*Age 24 | -362 | 297 | -0.007 | -0.079 | 2,178 |
| | [94]*** | [421] | [0.007] | [0.014]*** | [877]** |
| Pathways*Age 25 | -551 | 288 | -0.020 | -0.146 | 1,324 |
| | [110]*** | [520] | [0.008]** | [0.015]*** | [926] |
| Pathways*Age 26 | -343 | 1,962 | 0.040 | -0.094 | 2,149 |
| | [106]*** | [533]*** | [0.008]*** | [0.015]*** | [1,204]* |
| Pathways*Age 27 | -311 | 4,328 | 0.085 | -0.095 | 2,374 |
| | [149]** | [820]*** | [0.011]*** | [0.029]*** | [1,261]* |
| Pathways*Age 28 | -486 | 2,863 | 0.088 | -0.161 | 2,362 |
| | [118]*** | [645]*** | [0.011]*** | [0.019]*** | [1,224]* |
| Constant | -4,534 | 29,939 | -0.143 | -0.503 | 64,198 |
| | [1,797]*** | [7,040] | [0.102] | [0.274]* | [21,321]*** |
| Observations | 48,069 | 48,069 | 48,069 | 47,115 | 26,842 |
| R-squared | 0.061 | 0.098 | 0.048 | 0.034 | 0.087 |

Notes: The sample is the same as in Table 1. Employer quality is the median earnings of the largest firm an individual works for. Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for gender, immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with 70-1 = 69 degrees of freedom. *** p<0.01, ** p<0.05, * p<0.1.