

The University of Toronto-Toronto District School Board

Cohort Analysis

Report 1: Introductory Findings

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Executive Summary

Thirty years ago, a bare majority of students graduated from high school and most of those students directly entered workplaces. Today, most students go directly to university or college, while others will pursue further studies after a few years in the workplace. *College readiness* – the degree to which public school prepares students for success in postsecondary – has become a necessary measure (perhaps the most important measure) of educational effectiveness.

So far there has been limited research on college readiness in Ontario. The Toronto District School Board (TDSB) has examined the characteristics of students in its cohort studies who transfer into Ontario universities and colleges. The TDSB data are particularly useful due to their extensive set of socio-demographic and secondary achievement variables. However, this project is the first to directly link TDSB student cohorts to the completion of post-secondary studies of the University of Toronto (U of T), the TDSB's single largest post-secondary partner.

This is the first in a series of reports examining the long-term academic progress of these students. This report looks from the general perspective of the secondary school transition into post-secondary to university graduation. Other analyses will examine the progress of students within the University of Toronto, and provide a more detailed examination of the role that socio-economic, demographic, and school-level variables plays in post-secondary graduation.

The key **research questions** were:

- A. Are there typical educational pathways that students take from high school to university? Are there marked differences by gender, race, socioeconomic status (SES), neighborhood, immigration status, sexual orientation, prior academic performance, or other variables?
- B. What student characteristics from secondary school predict success in post-secondary education?
- C. Are there success factors and challenges that are faced by underrepresented groups as they transition from high school to university?

The match process: Approximately 200,000 TDSB Grade 9 cohort students were matched with approximately 225,000 students enrolled in the University of Toronto. There were 32,302 matches, a higher number than estimated. However, the analysis focused on students from five cohorts: the 2003 to 2007 cohorts (students who started Grade 9 between Fall 2003 and Fall 2007). This is because the TDSB Student Census was not done by

students prior to those in the 2003 cohort, while many students from later cohorts were still finishing their education at U of T. The TDSB Student Census, administered in 2006, 2011 and 2017, included a number of key socio-demographic variables such as student race, parental education levels, and parental occupation.

In total, there were 15,206 students who entered U of T out of a total of 90,597 across the five TDSB cohorts, representing an entrant rate of 17%. Of the 15,206 students who entered U of T, 10,821 or 71% had graduated from U of T by 2018. This 71% is a very conservative estimate: it does not include those who left U of T and might have graduated elsewhere, does not include the final graduation of more recent students, and omits those who had re-entered the post-secondary system after some interruption. The graduation rates that we report should not be considered definitive, but should instead be used to compare differences within and across the cohorts.

Results: This first report should be thought of as very preliminary. We've focused entirely on what are often called 'descriptives', statistical reports that examine one or two variables at a time, rather than larger statistical models that examine many variables simultaneously. This investigative report is intended to provide the overall background to more detailed analyses that will follow. In this preliminary report, we highlight several important findings.

First, we detect many of the same general socio-demographic, school, and achievement patterns that have been found in earlier TDSB and in related Ontario research on student achievement. For example, for several decades females have had higher graduation rates and post-secondary access than have males in the broader student population. In this report, we find that female students are similarly more likely to enter U of T, and once there, they fare better than males on average.

Second, there are many differences among demographic groups in terms of entering U of T, these differences tend to be mirrored in graduation rates, including broad differences by race, LBGTQ status, and family structure, indicating the importance of further research and policy/program initiatives. Generally, demographic gaps in entry from the TDSB into U of T are larger than are gaps in graduating from U of T. For example, there are quite wide gaps between categories of neighborhood income, parental education and parental occupation among students entering U of T, but those socioeconomic gaps become smaller when we examine U of T graduation rates. In other words, once students get into U of T, it matters less what neighborhood they come from, or what their parents did, or what education levels those parents had, though some differences remain.

Third, students who enter university directly from high school have a far higher chance of both entering and graduating from U of T, compared to those who take more indirect pathways. This pattern may simply reflect the longer time needed to follow students who take indirect pathways. Nonetheless, it is likely that several outcomes are worse for those students who take more complex pathways from high school into post-secondary studies, and this is an obvious direction for further research and policy.

Fourth, measures of prior academic achievement are the most powerful predictors in our data set. For example, we find that measures from students' first year of secondary school, such as Grade 9 credit accumulation and achievement on compulsory subjects (Geography, Mathematics, English, and Science) have a profound influence on entry and graduation from U of T. This is important because currently Grade 12 marks are used to decide admission into post-secondary institutions, yet these data show that earlier achievement is decisive for success in university. Our study suggests that educators at all levels may wish to reappraise their understanding of factors that shape academic pathways into and through post-secondary institutions.

Similarly, pathways within secondary schools, beginning in Grade 9, are strong predictors of university completion. Students' Program of Study (or "stream"), their absenteeism, special education needs status, and rates of being suspended are each closely connected to entry into and graduation from U of T. Other TDSB data (not shown in this report) suggest that similar variables measured when students are in their early elementary grades are also strongly predictive of their eventual pathways. These data suggest that factors that place students 'at risk' of being unsuccessful in higher education begin far earlier than Grade 12. We hope that our upcoming analyses will shed further light on the full development of secondary-postsecondary transitions.

Future Directions: Beyond this first preliminary step, our project is poised to next undertake a variety of possible directions, including the following:

- Examining other postsecondary outcomes, including fields of study, GPAs, student transfer processes, entry into professional and graduate programs
- Moving beyond descriptive analyses to multivariate analyses (regression, hierarchical linear modeling, propensity score matching, etc.)
- Comparing demographic profiles of U of T students who graduated with undergraduate versus graduate degrees
- Comparing patterns between U of T students from the TDSB versus those from other Ontario school boards, as well as International Students

- Examining outcomes between 'direct-entry' students with transfer students - those who entered U of T after initially enrolling at other colleges/universities
- Analysing differences between students who complete university in four years versus those who take longer periods of time.

We also hope that this project can serve as a role model for further data-sharing partnerships between large institutions such as school boards, colleges and universities, and various Ministries. There is currently a similar partnership between TDSB and York University that is using this project as a template. We believe that our project points to a need for further longitudinal and comprehensive analyses of student pathways and transitions.

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I. Introduction

Canada has one of the highest rates of post-secondary enrolment in the world. For the past fifteen years, the majority of students leaving Toronto secondary schools have directly entered the Ontario post-secondary system, and many others will also eventually attend post-secondary as adult students (see Brown and Marmureanu, 2017; Brown and Tam, 2016; Brown, Newton, and Tam, 2016). In general, youth with college and/or university credentials fare better than their peers on a range of life outcomes, ranging from income and employment to physical and mental health (Fonseca & Zheng, 2011; Irwin, 2015; Pew Research Center, 2014). But the range of pathways and life outcomes *among* postsecondary students and graduates themselves is huge, varying greatly by field of study, type of institution, and whether or not one eventually graduates. Entry into a college or university is only a first step in a lengthy set of educational pathways that lead to a variety of life outcomes.

If public school systems aim to prepare their graduates for their full lives, they can no longer focus only on high school graduation as their lone responsibility (Quan, 2017). Given Canada's comparatively high rate of post-secondary attendance, public school boards are looking further, taking a keen interest in their graduates' post-high school pathways and outcomes. At the same time, post-secondary institutions are increasingly recognizing the need to work more closely with their public school partners. This mutual recognition has helped spark a burgeoning body of research on inequalities of access and success among students from different demographic backgrounds (e.g. Davies, Maldonado, and Zarifa, 2014; Finnie, Childs, and Wismer, 2011; Sweet et al., 2010).

Educational pathways begin at kindergarten, and for many students, do not end until post-graduate study and adult education (Brown et al., 2017). This project is the first to directly link information on students from the Toronto District School Board (TDSB) from the beginning of secondary school (Grade 9) to the completion of post-secondary studies at the University of Toronto (U of T), the TDSB's single largest post-secondary partner.

This is the first in a series of reports that examines the academic progress of these students. This report examines transitions from secondary school into post-secondary and then to university graduation. Other analyses will examine the progress of students within the University of Toronto, and provide a more detailed examination of the impacts of socio-economic, demographic, and school-level variables on various post-secondary outcomes.

1. Cohort Studies - High School Graduation

Traditionally, cohort studies have provided the best way to observe long-term progress of the same students over time. For many decades starting with 1959, Toronto and later Ontario cohort studies followed students through secondary school, beginning in Grade 9, to their high school completion (often five years later). In the first 1959 cohort, most (87%) Toronto Board of Education students did not complete high school (Brown, 2010, p. 51, based on Wright, 1967). By the 1987 Grade 9 cohort, slightly over half (56%) had completed secondary school by the end of five years. In contrast, among the 2012-2017 cohort, the vast majority (86%) of students completed secondary school after five years (Brown and Parekh, in progress). These Toronto studies are useful for charting broad trends in students' post-secondary pathways over time.

2. Connection of the Grade 9 Cohort to Postsecondary Pathways

Brown and Tam (2016) examined the post-secondary pathways of approximately 98,000 students in the six TDSB Grade 9 cohorts of 2004 to 2009. TDSB students attended all 44 Ontario post-secondary institutions (20 public universities and 24 colleges). However, half of TDSB students attended only four institutions (U of T, York University, Ryerson University, and George Brown College) and almost all (91%) attended one of 14 other institutions (see Appendix 2: Table 1). The characteristics of who attended post-secondary varied across the institutions, often dramatically (see Appendix 2: Table 2 for more detail).

3. Direct Postsecondary Pathways - Limits of Current Research

Over the past decade the TDSB Research department has worked with a number of university partners in examining post-secondary access and pathways. For example, Robson et al. (2014) looked at post-secondary pathways in the intersection of special education needs, student race, and neighbourhood income. TDSB Grade 9 Cohort Fact Sheets (e.g. Brown, R. S. & Tam, G., 2017) look at university and college confirmation patterns over two cohorts (2006-2011 and 2011-2016). McMaster Gateway Cities Project (<https://gatewaycities.mcmaster.ca/>) funded by a SSHRC Insight Grant, now in its final year, examined TDSB post-secondary pathways in the context of other key gateway cities that have high rates of immigration, including New York City, Chicago, and London, UK.

The TDSB post-secondary pathways studies have thus far documented those students who directly enter an Ontario postsecondary institution. However, those data have two limitations:

- A) They lack direct information on student fortunes after they enter post-secondary studies.
- B) The data cover only students who entered post-secondary institutions directly from the TDSB, missing those who may have entered post-secondary institutions indirectly. As such, the outcomes of students who transfer from one institution to another are still not fully understood. An excellent start has been provided by a number of recent Ontario studies sponsored by ONCAT (e.g., Robson et al. 2016, CET, 2016).

Significance of the Current Study

The current study overcomes some of the limitations of previous TDSB research studies. It is one of the first to comprehensively connect various demographic and achievement data from high school through to university to examine student and school characteristics that predict academic outcomes in both high school and university. It provides a longitudinal view by tracking successive cohorts that enter high school. It offers a method to track those students who take more complex and non-traditional routes, and can contribute to research on educational mobility, opportunity, equity, and stratification.

Detailed, longitudinal data on pathways from high school to university are rare in Canada. Large scale longitudinal surveys conducted by Statistics Canada (e.g., NLSCY, YITS) are anonymous and cannot be used to track students into particular universities. Administrative data collected by ministries lack measures of student demographics. Data that identify both contexts and demographics are incredibly vital for understanding access in post-secondary education and informing equity initiatives.

Research Questions

This exploratory study has three key research questions:

- A. What are the typical educational pathways students take from high school to university? Are there marked differences by gender, race, socioeconomic status (SES), neighborhood, immigration status, sexual orientation, prior academic performance, or other variables?
- B. What student characteristics from secondary school predict success in post-secondary education?
- C. What variables predict success and challenges faced by students from underrepresented groups as they transition from high school to university?

II. Background

The University of Toronto (U of T) is the single largest post-secondary destination for graduates from the Toronto District School Board (TDSB). Likewise, TDSB is U of T's single largest source of students. As the largest school board in Canada and fifth largest school board in North America, TDSB has 245,000 students from kindergarten to Grade 12 and over 100,000 continuing education students. TDSB has one of the most diverse student populations in the world. U of T is Canada's largest university with over 90,000 undergraduate and graduate students. It is widely considered among the top universities in the world.

1. The U of T-TDSB Dataset

Our dataset initially included 11 successive cohorts of all Grade 9 students in the TDSB, beginning with those who started secondary studies in Fall 2000, and ending with all Grade 9 Students who started in the Fall of 2010. Each cohort was followed within the TDSB for five full years. For example, students who started Grade 9 in Fall 2010 were followed from October 31, 2010 to October 31, 2015. Although the majority of university-bound students graduate in four years, five years is the traditionally accepted timeframe for the vast majority of students to finish their secondary school requirements. However, boards can get funding provided for up to eight years of secondary education.

This initial dataset contained a series of variables for approximately 200,000 TDSB students. Academic measures included Grade 9 credit accumulation, Grade 9 success indicators in English, Mathematics, Science (starting with the 2001 cohort), and Geography (starting with the 2003 cohort); Grade 9 absenteeism; Special Education status; student suspensions; Grade 9 program of study (a majority of courses taken in Academic, Applied, or Locally-developed courses); Grades 9-12 mean marks; 5-year graduation; and 5-year Ontario post-secondary confirmations. Demographic variables were available from the TDSB Student Census starting with the 2003 cohort, and offers information on ethno-racial identity, parental education and occupation, family structure, gender, and student attitudes towards school and schooling. Research suggests that these variables are strongly connected to high school graduation and transitions to post-secondary study (Brown, 2010; Brown and Tam, 2017; Robson et al., 2016).

2. University of Toronto Administrative Data

The TDSB Grade 9 cohort dataset was matched with information from U of T's administrative files that contained information on date of first/last term attended at U of T, campus and degree type, area of study, starting/award date of U of T degree, academic performance (final CGPA), enrolment in each session that includes registration status (full-time or part-time); and year of study and program of study.

3. Match of TDSB with U of T Students

Records were merged from approximately 200,000 TDSB students with approximately 225,000 students enrolled in the University of Toronto. This matching process had two steps: a) students were initially matched via the Ontario Education Number (OEN), which was introduced in Ontario in 2003, and was implemented in the Ontario post-secondary system in 2007; and b) for earlier students, an alphanumeric identifier was used as a second step (for more details, see Appendix 2). We originally estimated that this process would match 20,000 to 26,000 TDSB students with U of T records. However, these methods matched 32,302 students, 25% more than anticipated. These matches account for 17% of all TDSB students. This unexpected match rate was a product of including three "non-direct entry" groups: students who entered U of T one or more years after graduating from secondary school (usually, after being employed), students who transferred to U of T after entering another post-secondary institution (initially e.g., enrolling at York and then transferring to U of T), and students who may have completed an earlier post-secondary certificate, diploma, or degree, and then entered U of T for an additional educational certification.

The next stage of analysis looks in more detail at the differing educational entry points.

III. Analysis

1. Focus on the 2003-2007 cohorts

Although 10 TDSB cohorts were matched to U of T administrative data in total, the following analysis focuses on five successive cohorts: TDSB students who started Grade 9 in Fall 2003, to those who started Grade 9 in Fall 2007. These cohorts contain key variables from TDSB and U of T. The earlier 2000, 2001, and 2002 cohorts lack information from the TDSB Student Census. The TDSB Student Census, administered in 2006, 2011 and 2017,

included a number of key socio-demographic variables such as student race, parental education levels, and parental occupation. Further, the 2000 and 2001 cohorts had missing information for some students since the TDSB central administrative system was implemented only in 2003. In addition, several important student achievement variables, in particular achievement in Grade 9 Science and Geography were missing in earlier cohorts. The later cohorts (starting TDSB in 2008-2010) were also excluded as these students had not been in U of T long enough to complete 4 year undergraduate degrees. For example, the most recent (2007) cohort started Grade 9 in the TDSB in Fall 2007, and most would have entered U of T in Fall 2011 at the earliest, with many entering in 2012 and 2013. Others might have entered later after spending some time in the workforce or after attending other post-secondary institutions. Assuming they entered U of T in Fall 2011 after four years of secondary school, these students would have had seven school years to complete at least one U of T undergraduate degree. In total, these various exclusions left a remaining sample size of 90,597 TDSB students, of whom 15,206 (17%) entered U of T.

2. Entry and Graduation Rates for the 2003-2007 Cohorts

The following analyses rely on two key benchmarks: a) proportions of all students who entered U of T and b) proportions of students who graduated from U of T.

A) Entry Rate: 15,206 TDSB students out of 90,597 (17%) in the five selected cohorts (2003-2006) had entered University of Toronto by the 2017-18 school year.

B) Graduation Rate: Of those 15,206 TDSB students who entered U of T, 10,821 or 71% had graduated by 2018. We use these figures to compare subgroups. Note that this graduation rate of 71% is a very conservative estimate. Some students who lack a graduation record at the University of Toronto may have finished their degree at another post-secondary institution. Some 'indirect-entry' students that had transferred to U of T from another institution may not have yet had the necessary time to complete their graduation requirements. We estimate that the probable 'true' graduation rate is 10% higher, but can only provide accurate estimates for students for whom we have clear graduation records.

3. Entry and Graduation Rates - Cohort Differences

Table 3 shows that the oldest cohort (students who started Grade 9 in 2003) has the highest U of T graduation rate (73%) while the newest cohort has the lowest graduation rate (67%). We believe that this difference largely reflects the longer time the earliest cohort has had to graduate, and that the later cohorts will likely attain higher

graduation rates in the coming years. Similarly, there is also a noticeable difference in entry rates between the oldest 2003 cohort (18%) and the newest 2007 cohort (15%), again likely reflect the lengthier time windows for the older cohorts.

Table 3: TDSB Cohort Differences: 2003 through 2007 Cohorts

	Enter U of T		Graduate U of T	
	Did not Enter	Entrant	Non-grad	Graduate
All Cohorts (2003-2007)	83.2%	16.8%	28.8%	71.2%
2003 to 2008	81.8%	18.2%	27.2%	72.8%
2004 to 2009	83.0%	17.0%	27.6%	72.4%
2005 to 2010	82.8%	17.2%	27.3%	72.7%
2006 to 2011	83.8%	16.2%	29.5%	70.5%
2007 to 2012	84.6%	15.4%	33.2%	66.8%

4. Socio-demographic variables

Tables 4 and 5 display comparisons of TDSB graduates for entry into and graduation from U of T by key socio-demographic variables.

Entry rates: There are sizeable differences in entry rates, confirming earlier studies of other universities (e.g., Brown, 2008; Robson et al., 2014; Robson et al., 2016; Brown and Tam, 2016):

- Females are more likely to enter than males.
- Students from lower income neighborhoods are less likely to enter U of T than students in middle and higher income neighborhoods.
- Students who described themselves as Aboriginal, Latin American or Black had noticeably lower entry rates; those describing themselves as White, Mixed, Middle Eastern, Southeast Asian had entry rates that were similar to the average TDSB rates; while those describing themselves as South and East Asian had higher entry rates.
- Those whose parents were in professional and senior management positions had higher entry rates; while those from unskilled clerical and trades, and those from non-remunerative backgrounds had lower entry rates.
- Those with parents who had university education had noticeably higher entry rates than that of other students.
- Those living with both parents had higher entry rates than those in single parent family structure categories.

Graduation rates: Compared to entry rates, group differences in graduation are somewhat muted, particularly for socioeconomic variables like neighborhood income, parental education, and parental occupation, though some notable differences remained. However, for other demographic variables, sizeable gaps were detected, with females and East Asians having higher graduation rates, Southeast Asian, Mixed, Middle Eastern, and White students having average rates, and Black students being less likely to graduate than others. There was also a graduation gap between students living with two parents and those living with a mother or father only and with those living in other family arrangements (74% for those living with both parents compared to 58% for those in other family arrangements such as living with grandparents, by themselves, in group homes, etc.).¹

LGBTQ students are only slightly less likely to get into U of T compared to Heterosexual students (15% compared to 19%) but this gap increased for graduation (62% of LGBTQ students compared to 73% among Heterosexuals).

¹ The family structure referred to the time in public school when the students answered the Student Census.

Table 4: Socio-demographic Variables: Gender, Income and Race

Key Demographic Variables		Enter U of T		Graduate U of T	
		Did not Enter	Entrant	Non-grad	Graduate
Gender	Female	79.9%	20.1%	26.5%	73.5%
	Male	86.3%	13.7%	32.0%	68.0%
Neighborhood Income	Lowest income	86.6%	13.4%	31.8%	68.2%
	Middle income	81.6%	18.4%	27.8%	72.2%
	High income	81.5%	18.5%	27.5%	72.5%
Race	Aboriginal	94.8%	5.2%	*	*
	Black	92.1%	7.9%	49.5%	50.5%
	East Asian	69.8%	30.2%	19.8%	80.2%
	Latin American	92.8%	7.2%	*	*
	Middle Eastern	82.5%	17.5%	28.8%	71.2%
	Mixed	84.9%	15.1%	32.5%	67.5%
	South Asian	77.2%	22.8%	29.0%	71.0%
	Southeast Asian	83.2%	16.8%	34.3%	65.7%
	White	85.0%	15.0%	29.7%	70.3%

* Information not released since less than 100 cases

Table 5 : Socio-demographic Variables : Parental Occupation, Parental Education, Sexual Orientation

Key Demographic Variables		Enter U of T		Graduate U of T	
		Did not Enter	Entrant	Non-grad	Graduate
Parent Occupation	Professional and senior management	75.0%	25.0%	25.7%	74.3%
	Semi-professional and middle management	80.3%	19.7%	27.7%	72.3%
	Skilled semi-skilled clerical and trades	84.1%	15.9%	29.9%	70.1%
	Unskilled clerical and trades	85.6%	14.4%	30.2%	69.8%
	Non-remunerative	87.2%	12.8%	33.8%	66.2%
Parent Education	High School	84.9%	15.1%	31.4%	68.6%
	College	84.4%	15.6%	30.5%	69.5%
	University	76.5%	23.5%	25.5%	74.5%
	Don't Know	87.3%	12.7%	31.4%	68.6%
Sexual Orientation	Heterosexual	81.1%	18.9%	27.0%	73.0%
	LGBTQ	85.3%	14.7%	38.2%	61.8%
	Questioning or not sure of orientation	83.2%	16.8%	27.6%	72.4%
Family Structure	Two Parents	79.8%	20.2%	26.2%	73.8%
	Mother only	86.4%	13.6%	36.0%	64.0%
	Father only	87.8%	12.2%	29.7%	70.3%
	Other	89.6%	10.4%	42.1%	57.9%

5. School Variables

Earlier TDSB and related Ontario research have shown that academic variables from Grade 9 such as Program of Study [stream]; Special Education Needs status; being suspended; and absenteeism have strong effects on later outcomes (e.g., Brown, 1997; Robson et al., 2014; Brown and Tam, 2016; Quan and James, 2017; Ontario Ministry of Education, 2017). Entry rates into U of T (Table 6), are consistent with this research. Students in Academic programs, those without Special Education Needs, those with a Gifted exceptionality, those never suspended, and those with low levels of absenteeism are all much more likely to gain entry to U of T.

Similar patterns emerge when examining university graduation, though most of these gaps are somewhat smaller. For instance, while students in Academic programs in Grade 9 were over five times likelier to enter U of T than those taking Applied courses (22% to 4%), among those who entered U of T, 73% from academic streams in Grade 9 graduated, compared to 48% of those from the Applied stream.

Table 6: School Variables

School Variables		Enter U of T		Graduate U of T	
		Did not Enter	Entrant	Non-grad	Graduate
Grade 9 Program of Study	Academic	77.9%	22.1%	27.4%	72.6%
	Applied	96.1%	3.9%	52.5%	47.5%
	Locally-developed Essentials	99.2%	0.8%	*	*
	Not enough level credits	97.3%	2.7%	*	*
Special Education Needs	Gifted Exceptionalities	65.0%	35.0%	22.1%	77.9%
	Students without Special Education Needs	81.8%	18.2%	28.5%	71.5%
	Exceptionality Excluding Gifted	97.0%	3.0%	51.2%	48.8%
	Non-identified Special Needs and or IEP	93.8%	6.2%	42.7%	57.3%
Suspended Once or more	Not suspended	79.9%	20.1%	27.0%	73.0%
	Suspended	93.9%	6.1%	48.6%	51.4%
Grade 9 Absenteeism Rate	0 to 2% of Grade 9 instructional days	77.4%	22.6%	24.2%	75.8%
	3 to 5%	85.3%	14.7%	32.8%	67.2%
	6-10%	89.0%	11.0%	41.5%	58.5%
	11-20%	93.2%	6.8%	48.8%	51.2%
	21% or more of Grade 9 instructional days	97.2%	2.8%	65.4%	34.6%

6. Secondary School Achievement - Five Year Graduation

This section examines two types of achievement variables: a summative measure (Grade 12 achievement) and a formative measure (credit accumulation and achievement in compulsory subjects during Grade 9).

Table 7a shows secondary school status at the end of five years of high school.² Most students finish by the end of Year 5, and perhaps unsurprisingly, those students have a much higher chance of entry to U of T compared to those still in the TDSB in Year 6 or later, as well as those who transferred to other school boards, and those who dropped out.

The vast majority of TDSB graduates who enter U of T also graduate from that university (73%). In contrast, only 15% of those who needed six years to graduate from TDSB, and 40% of those who dropped out of high school but later entered U of T, were eventual U of T graduates. Our working hypothesis is that similar life and academic circumstances that made students unable to graduate from high school in timely fashion also hold them back from graduating university, but more research on this topic is needed.

Interestingly, 60% of students who transferred out of the TDSB during their high school years, but eventually entered U of T, also graduated from U of T. Many of these transfer students moved with their families to other parts of Ontario (see TDSB Environmental Scan, 2013-14). Some, however, may have done so due to educational challenges such as lower achievement. This combination of different reasons may explain why transfer students have somewhat lower university graduation rates compared to those who remaining within the TDSB. This is another area where more research would be useful.

² Year 1 for secondary school is usually Grade 9 for 14 year olds. Students can enroll in secondary schools until they turn 21, which is generally Year 8. After that, students are encouraged to finish their graduation requirements through continuing education, by attending adult education centres, or taking e-learning courses, summer school, or night school.

7. Secondary School Achievement - Direct Postsecondary Entry Status

Table 7b displays outcomes for students after five years of high school (provided to TDSB by Ontario’s university and college application centres, OUAC and OCAS).³ The table shows that a third of university-bound TDSB students eventually went to U of T, while those taking indirect pathways entered U of T at much lower rates. The proportion of students who went to an Ontario college and then entered U of T is especially low (2%).

Table 7: Five-year Secondary School Graduation and Post-Secondary Entry

Secondary School Achievement		Enter U of T		Graduate U of T	
		Did not Enter	Entrant	Non-grad	Graduate
7a Five year Graduation	Grad or 30+ credits	78.1%	21.9%	26.6%	73.4%
	In TDSB Fall Next Year	97.4%	2.6%	84.5%	15.5%
	Transfer outside TDSB	91.5%	8.5%	40.3%	59.7%
	Dropout	96.4%	3.6%	59.7%	40.3%
7b Direct Post-sec Entry Status (5 year)	Confirm University in Ontario	67.0%	33.0%	23.7%	76.3%
	Confirm College in Ontario	97.6%	2.4%	74.4%	25.6%
	Apply to post-secondary in Ontario	89.3%	10.7%	48.0%	52.0%
	Did not apply to post-secondary	95.3%	4.7%	51.4%	48.6%

³ This would also include students who used the OUAC application system to apply for post-secondary institutions outside of Ontario, such as McGill or UBC; OUAC however does not provide the final confirmation information of students outside of Ontario. Previous research estimates that this group represents 3-4% of the cohort, often those in very high income neighbourhoods.

8. Secondary School Achievement: Grade 9 Credit Accumulation

Grade 9 credit accumulation is a strong predictor of high school graduation and post-secondary access (Brown, 1993; Brown, 2006; Brown et al., 2012; Robson et al., 2016; Quan and James, 2017). That is, students who successfully complete the expected eight credits in their first year of secondary school have generally strong outcomes, while those who fail or drop a course have a more problematic transition to post-secondary (Brown et al., 2016). This variable also predicts entry and graduation rates from U of T. Only 5% of students with 7 Grade 9 credits attended U of T compared to 20% with 8 credits. Likewise, 39% of students with 7 Grade 9 credits eventually graduated from U of T, compared to 72% for those with 8 credits. Confirming previous research, dropping even one Grade 9 credit can be a pivotal event for students' academic futures; the processes that prompt students to drop Grade 9 credits casts a long shadow on their university years.

Table 8: Grade 9 Credit Accumulation

Secondary School Achievement		Enter U of T		Graduate U of T	
		Did not Enter	Entrant	Non-grad	Graduate
Grade 9 Credit Accumulation	0 credits in Grade 9 (incl. summer school)	99.3%	0.7%	58.3%	41.7%
	1 Grade 9 credit (7 credits below standard)	98.7%	1.3%	92.3%	7.7%
	2 Grade 9 credits (6 credits below standard)	98.0%	2.0%	71.4%	28.6%
	3 Grade 9 credits (5 credits below standard)	98.2%	1.8%	67.9%	32.1%
	4 Grade 9 credits (4 credits below standard)	97.1%	2.9%	74.1%	25.9%
	5 Grade 9 credits (3 credits below standard)	97.6%	2.4%	81.7%	18.3%
	6 Grade 9 credits (2 credits below standard)	96.7%	3.3%	67.2%	32.8%
	7 Grade 9 credits (1 credit below standard)	95.0%	5.0%	61.3%	38.7%
	8 Grade 9 credits (standard)	79.6%	20.4%	27.7%	72.3%
	9 credits (1 credit above standard)	72.1%	27.9%	21.4%	78.6%
10 or more credits (2 credits above standard)	69.2%	30.8%	21.2%	78.8%	

9. Secondary School Achievement: Compulsory Grade 9 Credits

Under the current Ontario secondary school curriculum (OSS), Grade 9 students are required to complete credits in English, Mathematics, Science, and Geography.⁴⁵ These four indicators have been found to be strong predictors of high school graduation. For example, with the 2004-2009 cohort, the majority who did not complete one of those credits also failed to graduate high school by the end of five years, while the vast majority of students at Levels 3 and 4 (a mark of 70 or more) graduated. Geography was a slightly more accurate predictor of graduation than the other subjects, but generally the same pattern could be seen for all four subjects (Brown, 2010, pp. 13-15).

We found that achievement in these four mandatory subjects was also related to entry into U of T. Among those who did not complete a Grade 9 credit in Mathematics by the end of Year 1, only 3% later entered U of T. In comparison, of those with a Mathematics mark of 80 or more, 33% entered U of T. And, whereas 38% of those without a Grade 9 Mathematics that entered U of T managed to eventually graduate, 80% of those with Level 4 (an 'A') in Grade 9 graduated from U of T. Thus, 'A' students in Grade 9 Mathematics were 10 times likelier than those who did not get a credit in that course to enter U of T, and once in U of T, they were over twice as likely to attain a U of T degree. Mathematics is well known as a 'gatekeeper' that shapes academic paths (e.g. Brown et al., 2015). But it should be emphasized that similar patterns can be seen for Grade 9 Geography, English, and Science (see Tables 9a and 9b).

⁴ ELL-ESL students in Grade 9 students may complete an ESL/ELL requirement rather than an English course during the year, but are still required to eventually complete an English course. Students also are required to complete a credit in physical education.

⁵ The first Secondary Success Indicators Grade 9 cohort of Fall 2000 included English and Mathematics. Science was added with the Fall 2001 cohort, and Geography with the Fall 2003 cohort.

Table 9a: Grade 9 Mathematics/Geography

Secondary School Achievement		Enter U of T		Graduate U of T	
		Did not Enter	Entrant	Non-grad	Graduate
Grade 9 Mathematics Achievement	Level 0 (no completed Mathematics credit by end Grade 9)	97.3%	2.7%	67.4%	32.6%
	Level 1 Completed Mathematics Credit mark of 50-59	92.4%	7.6%	49.7%	50.3%
	Level 2 Completed Mathematics Credit mark of 60-69	87.5%	12.5%	39.1%	60.9%
	Level 3 Completed Mathematics Credit mark of 70-79	81.0%	19.0%	29.5%	70.5%
	Level 4 Completed Mathematics Credit mark of 80 plus	67.3%	32.7%	20.1%	79.9%
Grade 9 Geography Achievement	Level 0 (no completed Geography credit end Grade 9)	97.1%	2.9%	62.5%	37.5%
	Level 1 Completed Geography Credit mark of 50-59	94.6%	5.4%	60.9%	39.1%
	Level 2 Completed Geography Credit mark of 60-69	89.7%	10.3%	43.6%	56.4%
	Level 3 Completed Geography Credit mark of 70-79	82.4%	17.6%	31.2%	68.8%
	Level 4 Completed Geography Credit mark of 80 plus	69.4%	30.6%	20.9%	79.1%

Table 9b: Grade 9 English/Science

Secondary School Achievement		Enter U of T		Graduate U of T	
		Did not Enter	Entrant	Non-grad	Graduate
Grade 9 English Achievement*	Level 0 (no completed English credit by end Grade 9)	97.9%	2.1%	68.2%	31.8%
	Level 1 Completed English Credit mark of 50-59	94.9%	5.1%	60.2%	39.8%
	Level 2 Completed English Credit mark of 60-69	89.7%	10.3%	39.6%	60.4%
	Level 3 Completed English Credit mark of 70-79	81.5%	18.5%	30.8%	69.2%
	Level 4 Completed English Credit mark of 80 plus	68.4%	31.6%	21.3%	78.7%
Grade 9 Science Achievement	Level 0 (no completed Science credit end Grade 9)	96.9%	3.1%	60.4%	39.6%
	Level 1 Completed Science Credit mark of 50-59	93.9%	6.1%	54.5%	45.5%
	Level 2 Completed Science Credit mark of 60-69	89.2%	10.8%	42.5%	57.5%
	Level 3 Completed Science Credit mark of 70-79	81.3%	18.7%	30.7%	69.3%
	Level 4 Completed Science Credit mark of 80 plus	67.8%	32.2%	20.1%	79.9%

*Excluding students who did not take English but took ELL-ESL courses during Grade 9.

10. Very High Achievement: A Composite Variable

The predictive strength of the four compulsory Grade 9 achievement and credit accumulation variables prompted us to create a composite variable from all five Grade 9 achievement variables, using four categories:

- A) Low achievement: Completed fewer than 8 Grade 9 credits
- B) Medium achievement: Grades below 80 in all four subjects, but with a credit accumulation of 8+ Grade 9 credits
- C) High achievement: Level 4 grades (A) in 1-3 of the four mandatory Grade 9 credits
- D) Very high achievement: Level 4 grades (A) in all four mandatory Grade 9 credits.

This composite variable is a strong predictor of U of T entrance, stronger than any other variable we tested: 3% of low achievers entered U of T, compared to 40% of very high achievers. Very high achievers comprised 11% of the total TDSB cohort population but 27% of the population of TDSB graduates in U of T. Of those who entered U of T, 31% of low achievers graduated compared to 84% of very high achievers. Thus, Grade 9 achievement explains much of students' eventual outcomes at U of T.

Table 10: Very High Achievement

Secondary School Achievement		Enter U of T		Graduate U of T	
		Did not Enter	Entrant	Non-grad	Graduate
Grade 9 Composite Achievement	Low- Fewer than 8 credits	97.1%	2.9%	69.3%	30.7%
	Medium- Below Level 4 but 8 plus credits in Grade 9	89.4%	10.6%	42.3%	57.7%
	High- Level 4 in one to three Grade 9 subjects	77.0%	23.0%	27.5%	72.5%
	Very high: Level 4 in all four Grade 9 subjects	59.8%	40.2%	16.2%	83.8%

Preliminary Conclusions

This preliminary report summarizes a series of ‘descriptive’ findings and provides a broad sketch of pathways by which students transition from TDSB into and through U of T. By comparing rates between major subgroups, it provides a solid basis for more detailed analyses that will follow.

Despite its preliminary nature, we believe that this report confirms findings from a fairly extensive set of research studies using TDSB data over many years (e.g. Brown and Sinay, 2008; Davies, Maldonado, & Zarifa, 2014; Robson et al., 2014; Brown and Tam, 2016). U of T outcomes were similarly patterned by students’ socio-demographics, school experience, and prior achievement. For every variable, gaps in entry to U of T were mirrored by graduation gaps. Some graduation gaps were smaller than entry gaps, such as those between categories of neighborhood income, parental education, and parental occupation. In other words, once students get into U of T, their neighborhood of origin, or what their parents’ job and education levels mattered less, though differences remained. But other gaps remained significant. For example, female students have long had higher rates of postsecondary access than male students across Canada, and we found that they are also more likely to get into U of T, and once there, are more likely to graduate. Likewise, we also found sizeable variations by race, LBGTQ status, and family structure. These patterns highlight the need for further research and policy/program initiatives.

Similarly, students who enter university directly from high school have far higher chances of graduation, compared to those taking more indirect pathways. This may be partly a function of the longer time needed to track students through indirect paths, but it likely also reflects some real challenges that those students face. This is an obvious direction for further research.

While student demographics and pathways are important variables, our most powerful predictors were various achievement indicators. We found that students’ success in Grade 9 later had a profound influence on their entry into U of T, and their eventual graduation. This pattern reveals a key characteristic of academic trajectories: that postsecondary success is the product of a lengthy process that begins at much earlier ages. Similarly, students’ placement and engagement in various secondary programs are also strong predictors, as indicated by our findings for Grade 9 Program of Study (stream), absenteeism, Special Education Needs status, and student suspensions. Given the obvious importance of early achievement on university outcomes, it may be useful to reappraise our understandings of the determinants of student success, and to design supports and interventions that take its developmental nature into account. Some students who enter university are ‘at risk’ well before their first year,

or even before Grade 12. We hope that our upcoming analyses may provide further light on the developmental precursors of the secondary-postsecondary transitions.

Directions for Future Research

Our next steps for this research will take a variety of possible directions. One is to examine other university factors, such as students' field of study, GPA, and entry into undergraduate versus professional and graduate programs. Another will move beyond descriptive analyses and undertake multivariate analyses of these key factors, continuing to examine subgroup differences. A third direction will be to further uncover different pathways into U of T, comparing direct entry students to those who entered from other Ontario school boards or from international origins, those who enrolled initially at other colleges/universities, and who took more than four years to complete their undergraduate studies. We can examine also the pathways of students with Special Education Needs designation and those who attended various TDSB schools of choice.

Policy Implications of this Research

This research can potentially inform policies and interventions aimed at boosting student learning and outcomes. Its results will yield potential recommendations for policymakers and practitioners to enhance post-secondary student achievement, and help create best practices for at-risk students. This project can also serve as a role model for successful partnerships between large institutions, and will hopefully inspire similar or larger longitudinal projects among other institutions. For instance, a similar partnership between TDSB and York University is currently using this project as a template.

Appendix 1: The Data, Equity and Policy in Education Lab OISE, University of Toronto

The completed U of T-TDSB Dataset will be housed at the Data, Equity and Policy in Education Lab at OISE/UT.

Among the characteristics of the lab:

- Non-partisan, independent 3rd party research centre
- Multi-sector governance (universities, non-profits, government)
- Multi-disciplinary, multi-university (U of T, Waterloo, McMaster, Nipissing)
- Training ground for graduate students
- Main purposes: data sharing, training, presentation hub
- Advantages for data owners: cleaning, opportunities for funding and data access
- Capabilities: security and encryption, data storage and linking, remote access for non-sensitive data

Appendix 2: Post-secondary Pathways of TDSB Students

Table 1: Percentage of TDSB Student Confirmations at Post-Secondary Institutions, 2004 to 2009 Cohorts

Post-secondary Institution	Attendance (% of students)		
1. University of Toronto	19.3%		= 50.2%
2. York University	13.0%		
3. Ryerson University	11.3%		
4. George Brown College	6.6%		
5. University of Waterloo	6.1%		
6. Centennial College	5.6%	= 91.2%	
7. Seneca College	4.9%		
8. Humber College	3.8%		
9. University of Guelph	3.8%		
10. University of Western Ontario	3.4%		
11. McMaster University	3.1%		
12. Queen's University	2.8%		
13. Wilfred Laurier University	1.9%		
14. University of Ontario Institute of Technology	1.2%		
15. OCAD University	1.1%		
16. Carleton University	1.1%		
17. Brock University	0.9%		
18. University of Ottawa	0.8%		
19. Sheridan College	0.7%		
20. Durham College	0.7%		
21. Trent University	0.5%		
22. University of Windsor	0.3%		
23. Fanshawe College	0.2%		
24. Fleming College	0.2%		
25. Georgian College	0.2%		

26. Lakehead University	0.2%
27. Laurentian University	0.1%
28. Nipissing University	0.1%
29. Mohawk College	0.1%
30. Algonquin College	0.1%
31. Niagara College	0.1%
32. Conestoga College	0.1%
33. St. Lawrence College	0.1%
34. Sault College	0.1%
35. Loyalist College	0.1%
Other Post-secondary Institutions	0.2%

Source: Brown and Tam, 2016, p. 3.

For example:

- Generally universities had more female students and colleges had more male students but two universities (University of Waterloo and University of Ontario Institute of Technology) had over 60% male students.
- The range of students speaking English only went from 22% (University of Waterloo) to 68% (Queen's University).
- Students with special education needs were much more likely to be represented in colleges than universities.
- Over 90% of university-bound students took Academic courses in Grade 9; of the four mostly frequently-enrolled colleges, the range was from 45% (Centennial) to 60% (George Brown).
- There was a wide range of students living in the highest tertile or third of income, from 25% (Seneca College) to 63% (Queen's University).

**Table 2: Socio-economic and School Variables of Students by Post-Secondary Institution,
2004 to 2009 Cohorts**

Post-secondary Institution	Gender (% of students)		Language (% of students)	SEN (% of students)	Program of Study (% of students)	Grade 9 Mathematics (% of students)	Income (% of student)
	Female	Male	English	SEN excluding Gifted	Academic	Levels 3 & 4	Highest income tertile
1. University of Toronto	57%	43%	29.1%	3.3%	95.8%	76.2%	34.8%
2. York University	59.5%	40.5%	30.5%	5.5%	91.2%	54.6%	28.5%
3. Ryerson University	49.7%	50.3%	30.3%	5.2%	93.5%	61.1%	31.3%
4. George Brown College	49.9%	50.1%	52.7%	21.3%	59.8%	30.4%	26.7%
5. University of Waterloo	38.7%	61.3%	22.1%	1.6%	97.4%	90.5%	38.7%
6. Centennial College	43.4%	56.6%	51.6%	25%	44.5%	31%	27.1%
7. Seneca College	47.5%	52.5%	39.7%	21.7%	54.2%	32.4%	25%
8. Humber College	47.8%	52.2%	57.6%	21.1%	59.5%	28.8%	26.5%
9. University of Guelph	56.3%	43.7%	67.6%	6.7%	95.1%	61.7%	53.2%
10. University of Western Ontario	53.5%	46.5%	52.8%	3.1%	98.7%	79.2%	58.1%
11. McMaster University	51.6%	48.4%	36.5%	2.6%	97%	82.9%	43.8%
12. Queen's University	62.1%	37.9%	67.7%	3%	99.5%	83.7%	63.2%
13. Wilfred Laurier University	49.4%	50.6%	60.8%	6.6%	97.2%	61.1%	56.5%
14. University of Ontario Institute of Technology	32.7%	67.3%	25.7%	6.2%	87.9%	53.3%	34%

Source: Brown and Tam, 2016, p. 4.

Appendix 3: The Alphanumeric Identifier Used in the U of T- TDSB Merge Process

This briefly outlines the steps used to developed the alphanumeric identifiers used in the U of T-TDSB merge process (and a supplemental merge process in addition to the Ontario Education Number, or OEN). A brief discussion is also attached.

A. Designing the variable

The key is a straightforward alphanumeric variable of student last name, initial of first name, gender, and birthdate. To do this in SPSS:

1. Create an alpha 'gender' variable of 1 column width where F is female and M is male.
2. Create a alpha 'birthday' variable if 8 columns of year/month/day, e.g. 19871021 for birthdate of October 21 1987.
3. Create an alpha variable of 20 columns of last name ('last2') and initial of first name ('first2') from (in this case) variables 'lastname' and 'firstnam' with the following:

```
STRING last2 (A20).
```

```
COMPUTE last2 = UPCASE(lastname) .
```

```
EXECUTE .
```

```
STRING first2 (A2).
```

```
COMPUTE first2 = SUBSTR(firstnam,1,1) .
```

```
EXECUTE .
```

Note that this ensures that both last name and first initial are upper case.

4. Create the combined alphanumeric variable ('alphanew') with the following:

```
STRING alphanew (A34).
```

```
COMPUTE alphanew = CONCAT(gender,last2,first2,birthday) .  
EXECUTE .
```

5. Note: each of these variables needs to be complete for the match to be successful.

6. Variable to show Unique Identifiers

Create a variable within the main dataset (that dataset that the additional information is to be merged into) showing the unique and multiple cases of alpha

```
compute totnum = 1.  
execute.
```

```
AGGREGATE  
/OUTFILE=* MODE=ADDVARIABLES  
/BREAK=alphanew  
/alphatot=SUM(totnum).  
execute.
```

```
variable label alphatot Number of Alphanumeric Identifiers.  
execute.
```

```
freq var = alphatot.  
execute.
```

In the case of the TDSB 2000-2011 cohort dataset, for cases with complete information, the variable alphatot shows:

alphatot Number of Alphanumeric Identifiers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	213266	99.3	99.3	99.3
	2.00	1488	.7	.7	100.0
	3.00	39	.0	.0	100.0
	Total	214793	100.0	100.0	

Thus, 99.3% are unique cases that would be used in the match.

B. Creating Alphanumeric identifiers in the External Dataset

1. The process for creating the alphanumeric identifier 'alphanew' and the variable 'alphanew', would be replicated in the external dataset (for the U of T-TDSB cohort analysis, this was the U of T information). Make sure that the variable name 'alphanew' is changed to something else, e.g. 'alphanew2', since it will also be merged into the 'main' dataset.
2. The penultimate stage is to aggregate the key information to be merged into the main dataset.

There are actually two choices for this.

i.) With the U of T-TDSB match, we included the students' U of T number, and then merged additional information from the U of T files (session attended, graduation date, etc.) later by U of T number. This is because we were using the alphanumeric number to match students only for when the Ontario Education Number (OEN) was missing.

ii) the other way is to aggregate all the information that you need merged from the external dataset (e.g. session attended, graduation date, etc.) and then merge all this information into the 'main' dataset. Again, that was not done for the U of T-TDSB merge.

3. The aggregation process for merging (to get U of T number) would be:

AGGREGATE

```
/OUTFILE='FILE LOCATION\aggregated identifiers.sav'
```

```
/BREAK=alphanew
```

```
/Uninumb=FIRST(Uninumb)
```

```
/alphanew=FIRST(alphanew).
```

execute.

Where 'Uninumb' is the numeric identifier (e.g. University of Toronto number) while 'alphanew' is the variable identifying whether the case was unique ('1') or multiple.

4. Sort the 'main' file by 'alphanew' and merge the above 'aggregated identifiers' file by 'alphanew'.

5. You should use the merged information ('Uninumb' in this case) ONLY where the alpha identifiers are unique in BOTH datasets. In this case, the SPSS selection criteria would be
Select if (alphanew = 1 and alphanew = 1).
Execute.

C. Discussion

1. Issues of Matching

False positives

One reason for using only unique matches in both datasets is to reduce the possibility of false positives. There will still be false positives, but with a general uniqueness of over 99% in datasets of 200 K to 300 K, chances are that the incorrect matches will not threaten the overall validity of the analysis. The proviso is that the datasets need to be closely related. Thus, with the TDSB and U of T datasets, U of T was the single largest pathway for TDSB students (ultimately accounting for about a third of all university-bound students), while the TDSB was the largest single source of U of T students.

False negatives

The most obvious is the inability to use students who have identical alpha identifiers. This includes same gender, similarly named twins (0.45% of the general population are identical twins; while they are not always similarly named, it is not uncommon).

2. Other options for Matching

- 2 or 3 digit for first name: potentially more accurate but given the ways that students change the spelling of their first names over time, this has a possible slightly downside. We attempted a 3 digit first name match some years ago and the match process was approximately the same as using the first digit of the first name. However, this would be worth investigating as a future option.

- postal code: with 10% mobility per year, using the postal code of student residence would work only if the two datasets are at the exact same point in time. This would not work in a multiple year dataset.

- student language may be problematic. An analysis of both U of T and OCAS 'language' information found the students speaking English only was much higher for the post-secondary institute. A possible explanation is that students going into post-secondary are somewhat less likely to describe their home language, possibly because their language of instruction since kindergarten has been English.

3. Trends

Current administrative datasets are changing to an option for non-binary gender. Currently this is less than 1% of students but may increase in the future.

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