

Using Administrative Linkages to Examine Student Trajectories and Success – Insights from Various Toronto Studies Researchers

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Introduction

It is no longer appropriate for the public school system to focus on high school graduation as its primary outcome (Quan, 2017). At the same time, post-secondary institutions are increasingly recognizing the advantages of working more closely with their public school partners.

This is particularly important in Canada given the comparatively high rate of Canadian post-secondary attendance.

Student outcomes are increasingly looked at in a continuum, from kindergarten through post-graduate study and adult education. This presentation will provide several examples of longitudinal cohort studies originating from the Toronto District School Board (TDSB).

Cohort Studies

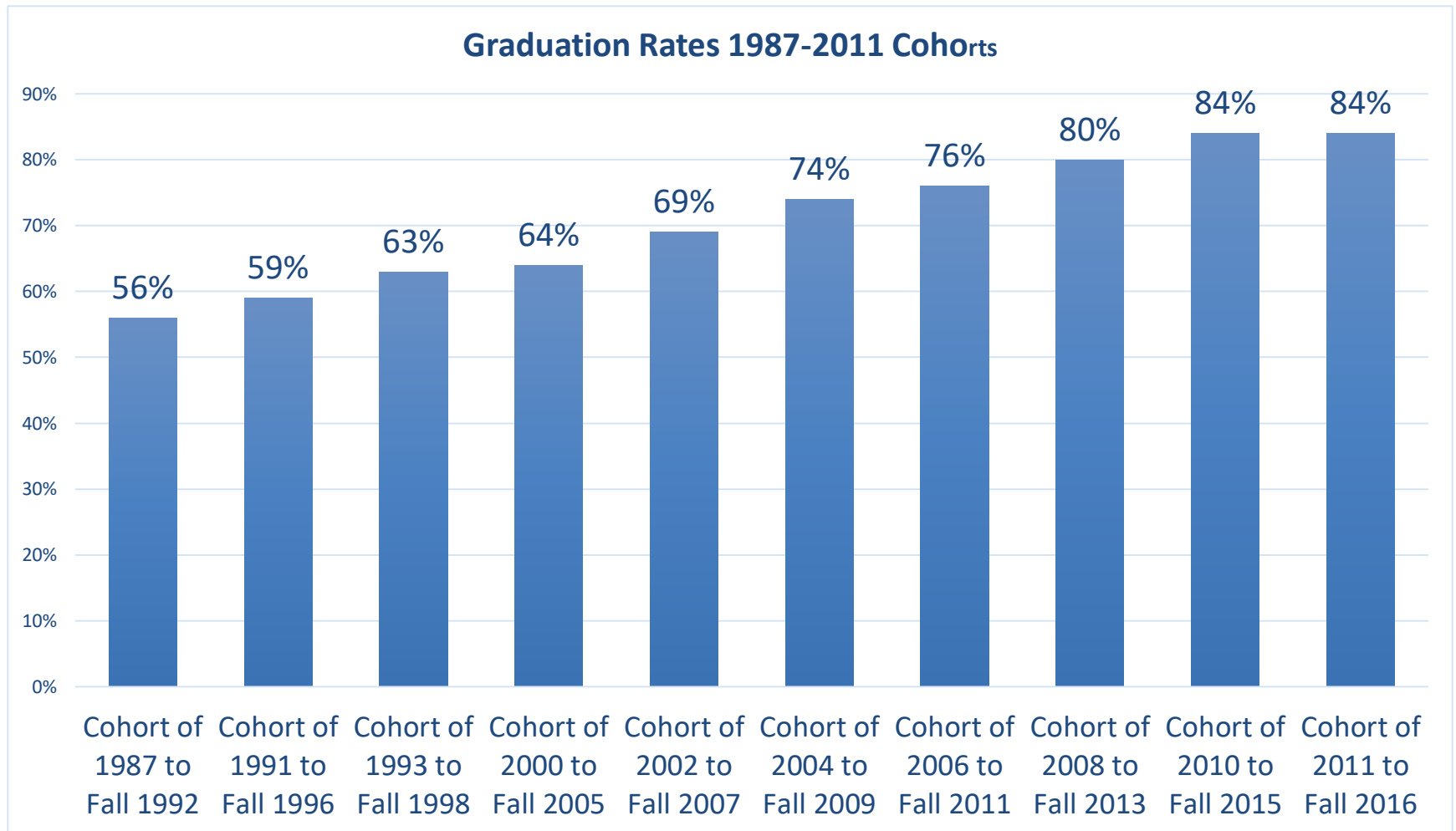
Traditionally, cohort studies have provided the best way to observe long-term progress of the same students.

For many decades starting with 1959, Toronto and later Ontario cohort studies have followed students through secondary school—from when they start secondary in Grade 9, to when most would have completed high school five years later.

The Toronto studies have more recently been used to document students' post-secondary pathways; and are now being used to follow student progress through post-secondary school and beyond.

We will show several examples research using Toronto cohort studies.

Ex. A. Long-term High School Graduation Trends



Cohorts of 1987, 1991 and 1993 started Grade 9 in the Toronto Board of Education (TBE); the cohorts of 2000 to 2012 started Grade 9 in the Toronto District School Board (TDSB).

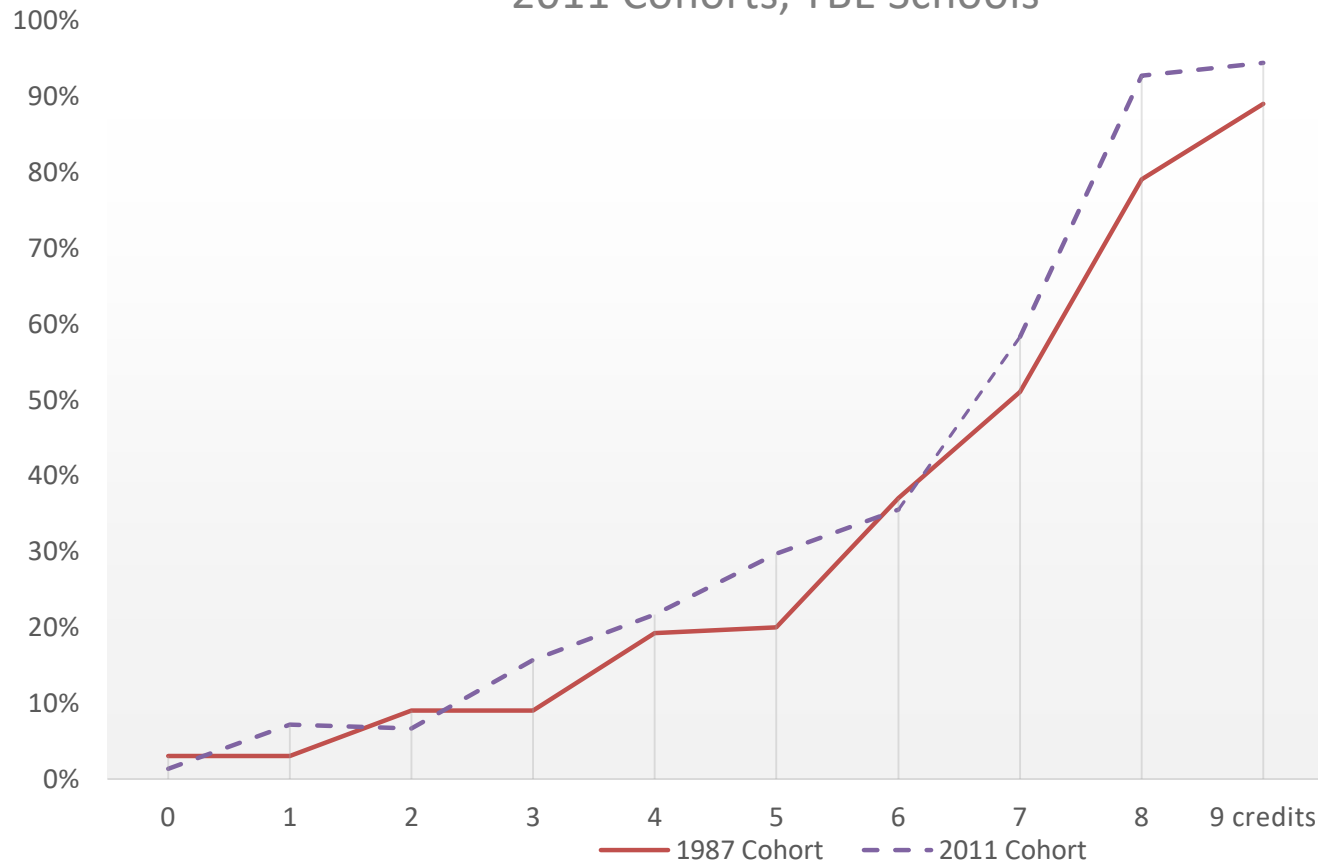
**Table 1: Grade 9 Cohorts of 1987 and 2011 Compared:
Graduation Patterns**

Variable	Subgroup	Grade 9 in 1987	Grade 9 in 2011
OVERALL		56	84
Program of Study	Advanced/Academic	69	91
	General/Applied	40	61
	Basic/Locally developed	27	50
Race	Asian	72	91
	Black	44	78
	White	59	87
Gender	Male	51	81
	Female	62	88
SES of parents	Professional	80	93
	Semi-professional	59	91
	Skilled/semi-skilled	61	84
	Unskilled	54	82
	Non-remunerative	44	78

Noticeable increases in graduation but very large gaps remain. Presented at CSSE, Vancouver, 2019

Credit Accumulation

Number of Grade 9 Credits and Five Year Graduation: 1987 and 2011 Cohorts, TBE Schools



1987: Started Grade 9 in Fall 1987. 2011: Started Grade 9 in Fall 2011.

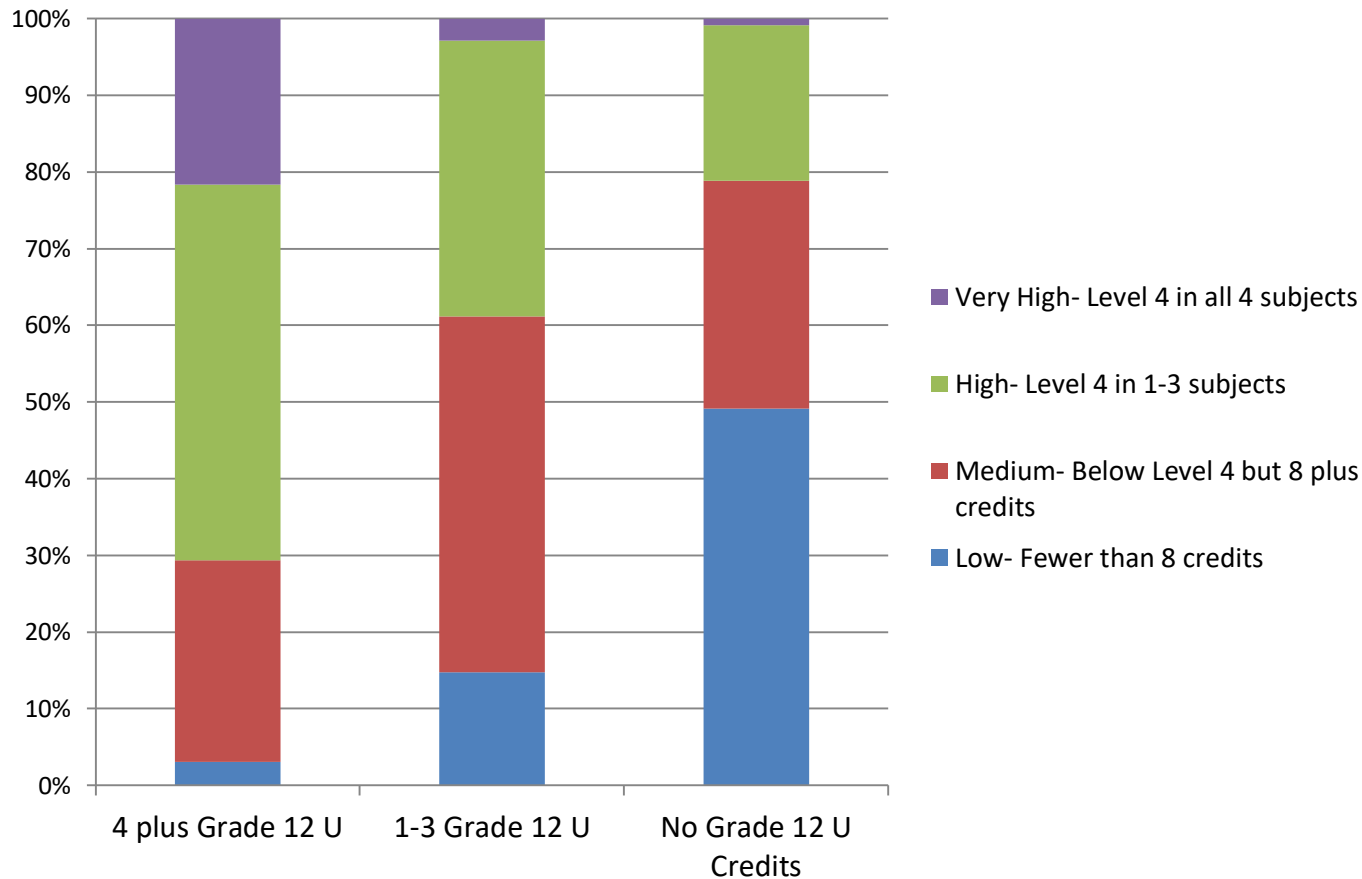
Key Finding: Grade 9 Credit Accumulation and graduation patterns are consistent over time.

Ex B: Composite Grade 9 Achievement and Key Socio-demographic Variables TDSB Grade 9 Cohorts 2005-2012

		Low-Fewer than 8 credits	Medium-Below Level 4 but 8 plus credits	High-Level 4 in 1-3 subjects	Very High-Level 4 in all 4 subjects
Race	Aboriginal (N =325)	46.2%	27.4%	25.5%	0.9%
	Black (14,137)	30.2%	39.0%	27.7%	3.1%
	East Asian (19,544)	5.2%	20.1%	48.7%	26.1%
	Latin American (2,155)	26.8%	36.3%	32.3%	4.5%
	Middle Eastern (5,431)	19.1%	35.4%	37.6%	8.0%
	Mixed (7,538)	18.2%	32.9%	37.9%	11.1%
	South Asian (24,043)	9.7%	30.9%	44.9%	14.5%
	Southeast Asian (4,893)	10.4%	29.6%	46.6%	13.5%
	White (35,222)	12.2%	32.0%	40.9%	14.8%
Gender	Female (62,259)	13.1%	26.5%	42.7%	17.7%
	Male (66,628)	19.4%	33.8%	37.2%	9.6%
Program of Study	Academic (94,687)	7.2%	30.8%	44.0%	18.0%
	Applied (27,443)	36.0%	32.1%	30.6%	1.2%
	Locally Developed (5,017)	54.9%	19.3%	24.9%	0.9%
	Not enough level credits (e.g K courses) (1,740)	96.2%	2.7%	0.9%	0.2%
All 2005 cohort onward	(N = 128,887)	16.4%	30.2%	39.8%	13.5%

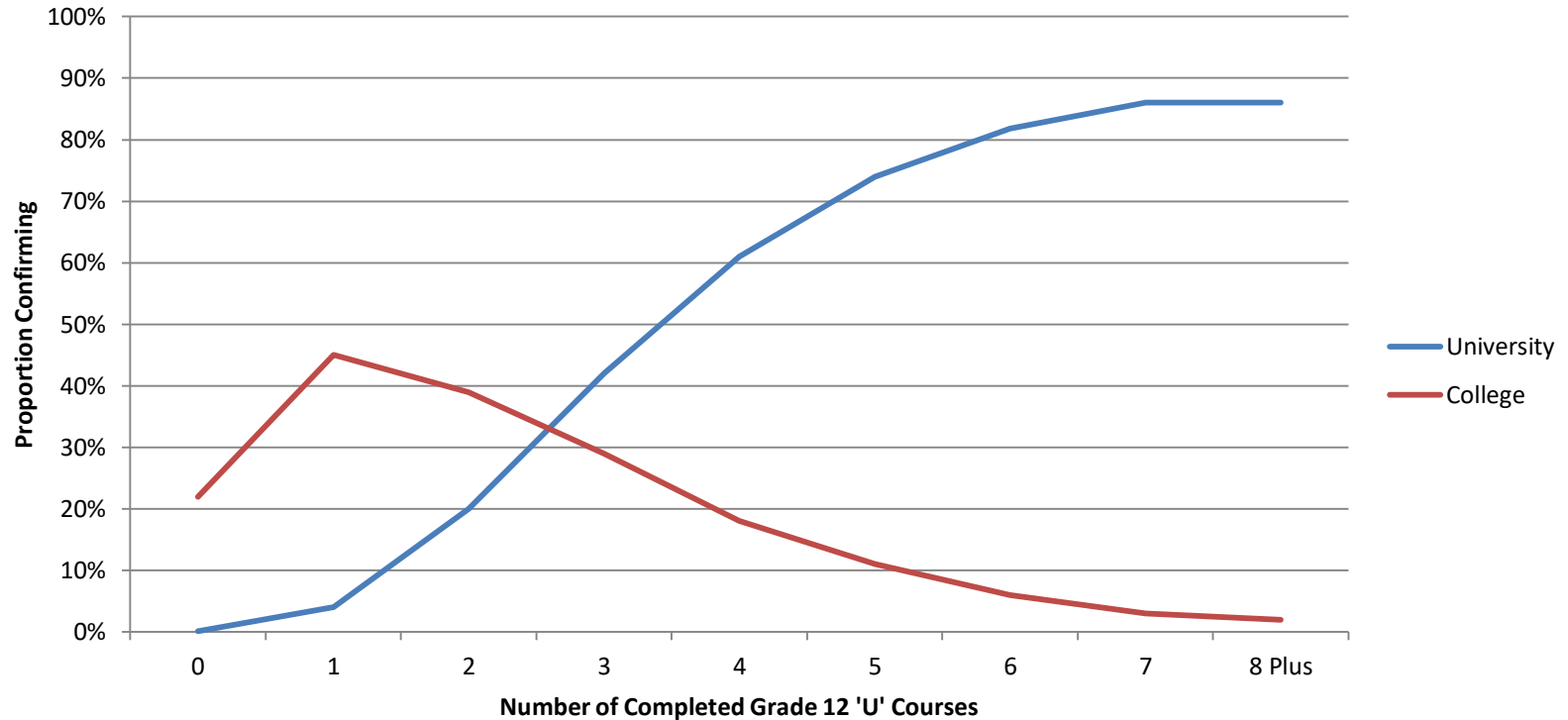
Number of students in 2005-2012 cohorts in brackets. Totals may not add up to 128,887 due to lower numbers completing the TDSB Censuses. Presented at CSSE, Vancouver, 2019. Grade 9 subjects are English, Math, Science and Geography.

Grade 12 U Course Completion According to Grade 9 Achievement



Key Finding: In general, the number of Grade 12 U courses completed is related to general Grade 9 achievement.

Number of Completed Grade 12 'U' Courses and Post-secondary Confirmations: 2005-2012 TDSB Cohorts



Key Finding: Most students going to college and almost all going to university completed a Grade 12 U course. Most university-bound students took four or more U courses.

Ex. C: The U of T-TDSB and York- TDSB Studies

- The University of Toronto-TDSB study (Brown, Davies and Chakraborty, 2019) followed by the York-TDSB study (Parekh, Brown and James, 2020) matched TDSB Grade 9 cohorts to U of T and York administrative data (including GPA, credits, and graduation).
- We looked at the 2003 to 2007 cohorts (students who started in Grade 9 2003-2007). We were able to use the TDSB Student Census data (administered 2006), while also able to follow students for long enough to graduate from university. Of 90K TDSB students, 15K were linked to U of T and 11K were linked to York.
- The same general findings in earlier studies of post-secondary pathways were found in these studies.

Demographic Variables

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%
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%
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%

* Information not released since less than 100 cases

Secondary School Achievement

Secondary School Achievement		Enter U of T		Graduate U of T	
		Did not Enter	Entrant	Non-grad	Graduate
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%
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%
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%	

Composite Variable: High Achievement

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

Composite variable constructed from the four Grade 9 subjects, and Grade 9 credit accumulation.

York-TDSB Study: Direct and Indirect Entry

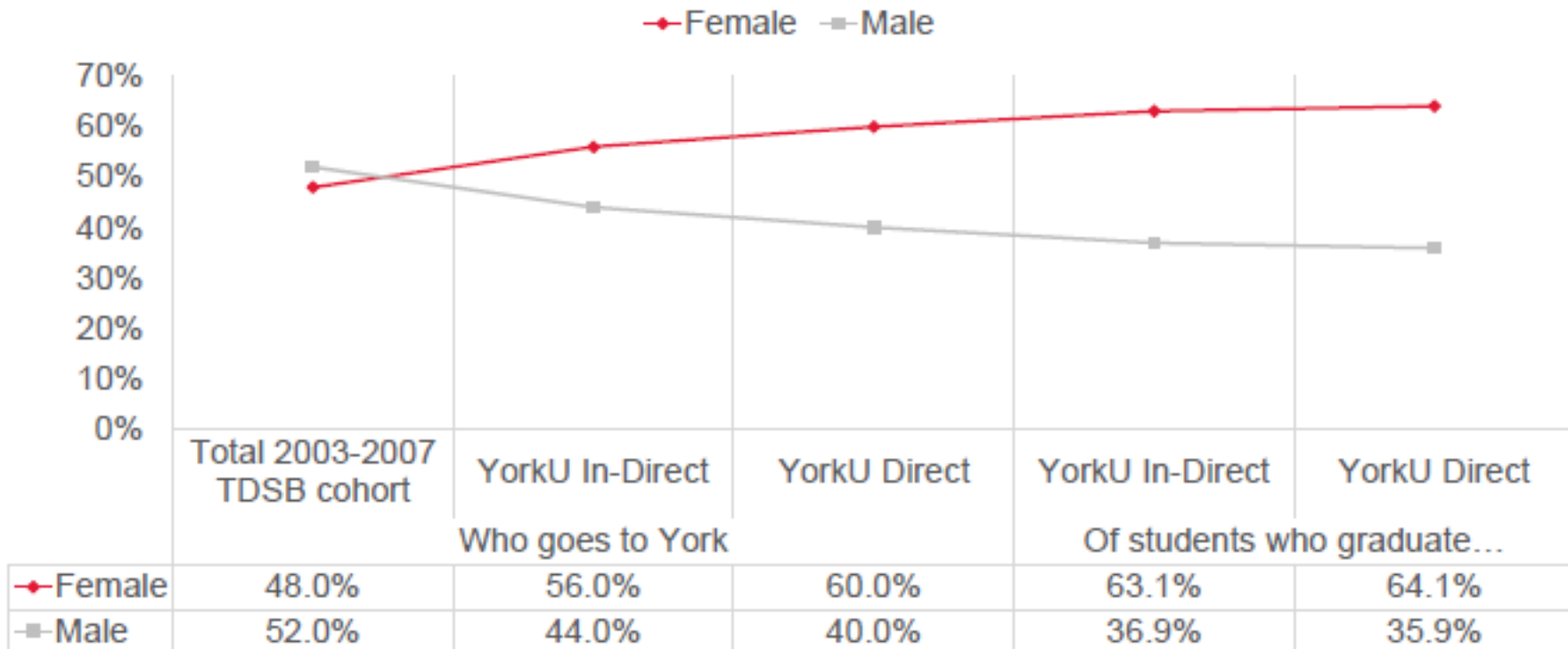
Key findings: The York-TDSB Study had a similar methodology to the U of T-TDSB Study (see Parekh, Brown, and James, 2020), but the initial findings focused on students who entered York directly (61%) and indirectly (39%).

Graduation rates for indirect entry students were lower than direct entry students. Indirect entry students often had greater challenges on entry to York compared to direct entry students.

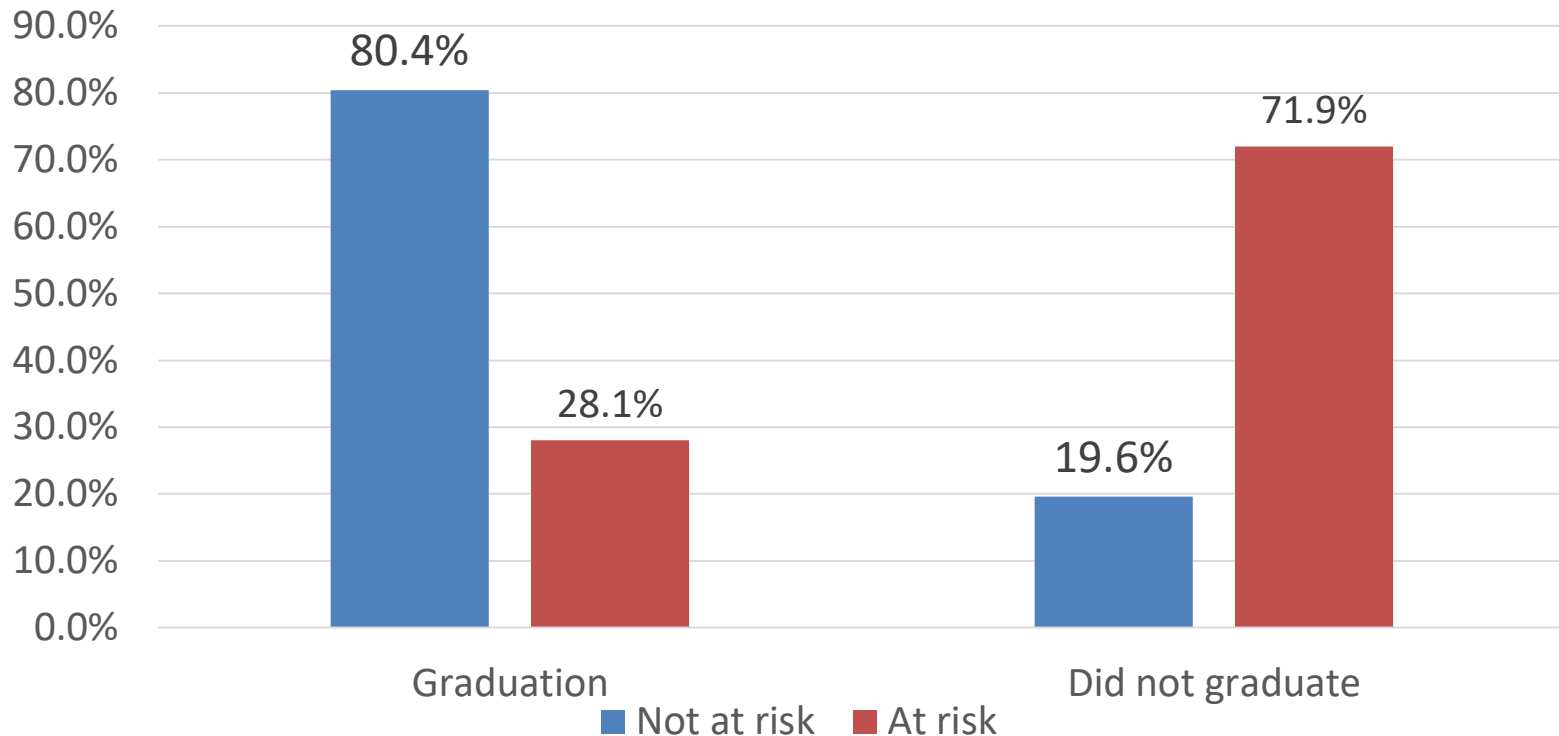
	Across pathways, % arriving to York	Across pathways, % of Ss who did not graduate	Across pathways, % of Ss who did graduate	Total N
Direct to York	61%	31.8%	68.2%	6,943
Another Uni then York	8%	40.8%	59.2%	961
College then York	7%	49.7%	50.3%	748
Applied from high school to postsecondary but did not direct enter York	8%	58.9%	41.1%	968
Did not apply to postsecondary in high school	16%	55.1%	44.9%	1,794
Total	100%	39.7%	60.3%	11,414

- **Takeaway:** -While female students make up just 48% of the total TDSB population, they represent 58.4% of students entering York University and 63.8% of students graduating overall. Female students are more likely to enter directly to York.
- -Conversely, male students represent 52% of the population within the TDSB, but only 41.6% of students entering York and 36.2% of students graduating overall.
- -These outcomes result in a 27.6% gender gap in students' overall graduation from York.

GENDER, ACCESS AND GRADUATION ACROSS INDIRECT/DIRECT PATHS

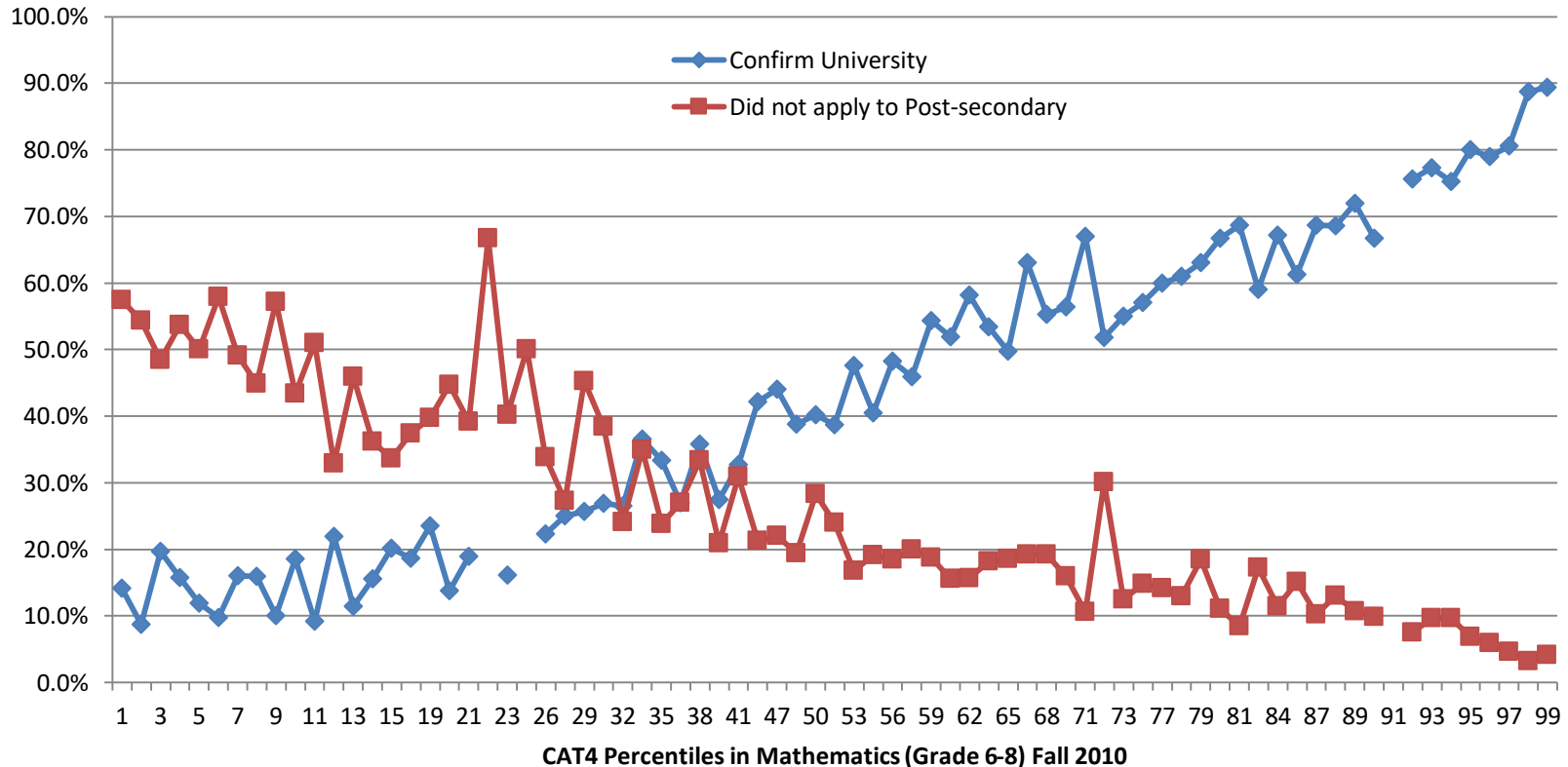


First-Year University at-Risk and Graduation (Direct Entry)



Takeaway: of around 7K direct entry students to York, an at-risk variable was calculated based on sessional GPA and credits in first year. Slightly less than a quarter (23%) of first-year students were identified as at-risk. The graduation rate of students identified through the at-risk indicator is 28%, while the graduation rate of students not identified is 80%.

Ex. D: CAT4 National Mathematics Percentiles (Grade 6-8) and University Confirmations (Year 5 Secondary)



Takeaway: The CAT4 test administered to Grade 2-8 students in TDSB's Model Schools for Inner City (MSIC) schools in Fall 2010. The test is consistent across grades. This figure looks at Mathematics scores amongst Grade 6-8 students, showing a very strong positive relationship to students' entry to university after five years in secondary school, and a strong negative relationship of Mathematics score to those not applying to postsecondary.

Ex. E: At Risk Status in Elementary and Grade 9: SK to Post-secondary Study (1999-2013)

- **Elementary at-risk:** With three elementary variables – high absenteeism in Grade 4, suspended at some point over the elementary panel, and being placed in a congregated Special Education class by Grade 5 – the majority of these students did not apply to post-secondary. That being said, each higher-risk group in itself did not by itself, account for a majority of students who did not apply. For example, over half (52%) of the students with very high absenteeism in Grade 4 did not apply to post-secondary. But those high absenteeism students accounted for only 18% of all students who did not apply to post-secondary.
- However, interestingly, **if the three elementary variables are combined, they account for half of the students who do not apply to post-secondary** (468 of 929 students who did not apply to post-secondary, or 50%).
- **Secondary at-risk:** When we looked at just two Grade 9 variables – students enrolled in the non-Academic streams, and those who completed fewer than the standard of 8 credits by the end of Grade 9 – this provided the row-column combination: most of the students who were identified as 'at-risk' this way did not go to college; while most who did not go to college were identified as 'at-risk' this way.

Figure 1: Non-application to Post-secondary – Elementary At-risk

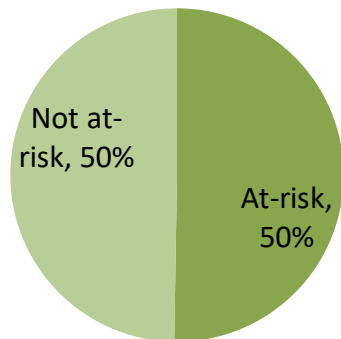
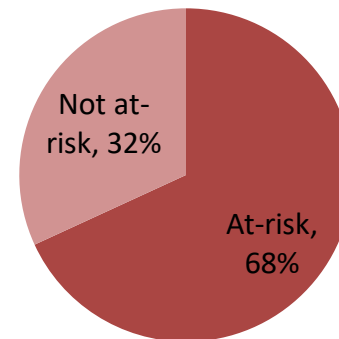


Figure 2: Non-application to Post-secondary – Secondary At-risk



2. Matching Challenges of Matching Cohort Data

- The TDSB was amalgamated from six previous boards in 1998, but one common Student Information system (using 'Trillium'/SRB) came into effect only in Fall 2003. Students who started in kindergarten in 2003 are only now in the early years of postsecondary.
- Long-term cohort analyses are most effective with one common educational system and student information system. This has rarely been the case. For example, a) in my career the Toronto Board of Education where I started, was amalgamated with the Toronto District School Board (TDSB). b) Changes in the secondary system between 1999 and 2003 meant that the most frequent age of transitioning to postsecondary went from 18 (turning 19) to 17 (turning 18). c) The key SIS system has changed over time (and, with the takeover of Trillium/SRB, may change in the future). d) And of course, student patterns themselves change (e.g. the increase in high school graduation rates). None of these are catastrophic in themselves, but tend to add many cumulative challenges for matching.
- Archival retrieval needs to be possible over the long term, For example, we found that the Toronto Board research projects are no longer retrievable due to changes over time.

Matching Challenges of Matching Cohort Data (Con'd)

- The Ontario Education Number (OEN) was implemented in the public school system in 2003, and by 2008-09 was in use across postsecondary. As a supplement to linking we used a series of alphanumeric identifiers used in the earlier years of TDSB amalgamation, using student last name and first initial, gender and birthdate. We found these to be much more stable over time than, say, student postal code, and they matched over 99% of students. The OEN seems to be complete for students making the direct and most of the indirect transition. However, we found that many older TDSB students returning to college (CAAT) could not be linked using OEN, at least in part because the OEN was not fully operational when they were in secondary school.
- But generally, the trend has been incremental but continuous and substantive data quality improvement over the years, in part due to the Ontario ONSiS system of data checking and signoff. Perhaps the increased connection with the Stats Canada PSIS system may lead to additional improvements (PSIS is currently not connected to secondary school data but pilot studies now going on may change this.)
- Ultimately, this should lead to a more systemic ability to examine progress from elementary school into the workplace, beyond pilot programs such as those using TDSB data.

3. Other examples of TDSB-related Research on Direct Post-secondary Pathways

HEQCO Post-secondary Pathways analysis comparing two TDSB cohorts (Robson, Maier, Anisef and Brown, 2019) :

http://www.heqco.ca/SiteCollectionDocuments/Formatted%20CRP%20report_FINAL.pdf

TDSB Grade 9 Cohort Fact Sheets, e.g.:

<http://www.tdsb.on.ca/Portals/research/docs/reports/FS3%20Grade%209%20Cohort%20Post-Sec%20Pathways%202011-16%20FINAL.pdf>

Parekh, G., Brown, R., & Zheng, S. (2018). Learning Skills, system equity and implicit bias within Ontario, Canada. Educational Policy. Published online December 2 2018.

4. Other Projects in Progress with TDSB Data

- SSRHCs approved in 2020: Prof. David Walters (Guelph), Prof. Gillian Parekh (York) Prof. Karen Robson (McMaster).
- Examination of financial information from Stats Canada: the TDSB Grade 9 cohort, Statistics Canada Postsecondary dataset (PSIS) and financial data (ONCAT project)
- Reload of U of T and TDSB data-more variables and cohorts (ONCAT project)

Summary-Key Findings

- From the York -TDSB study and U of T-TDSB study, it appears that students who directly transition to university have more solid secondary achievement patterns, and greater social advantage, compared to students who transition indirectly, or transfer postsecondary institutions. Direct transition students also have noticeably higher university graduation rates. The already-noticeable gender difference is also increased through the direct versus indirect entry patterns. Hopefully we will be able to get further information on this in future research.
- For most students, high school graduation and entry to postsecondary can be determined by the end of elementary school, and even more conclusively by the end of Grade 9. For most direct entries to university, university graduation can be predicted by the end of first year university. It is clear that postsecondary entry and performance is strongly influenced by both elementary and early secondary challenges (although we are still working to connect the dots). Truly effective postsecondary interventions therefore need to exist from the elementary level through postsecondary. This would require a very different system from the current Ontario education silos.

Summary-Key Findings (Con'd)

- The majority of students graduate from both high school and postsecondary within five years of entry, yet it may take another five years for a smaller group of students to graduate. The full, comprehensive examination of postsecondary pathways would be possible only by following a cohort of students for 25 years, from school entry to around the age of 29. Since this is difficult in practice at present, some sort of blended methodology may be required for the near future.

References from Examples

- Example A: Long-term High School Graduation Trends (Slides 4-6). From: Brown, R., & Parekh, G. Graduation and Post-secondary Pathways Over a Generation: Toronto Board of Education Long-term Trends. Paper Presented at the Canadian Society for the Study of Education (CSSE), Vancouver, British Columbia, June 2019.
- Example B: Composite Grade 9 Achievement and Key Socio-demographic Variables TDSB Grade 9 Cohorts 2005-2012 (Slides 7-9). From: Brown, R., Parekh, G., & Gallagher-Mackay, K. Connecting the Dots: Grade 9 Achievement, Grade 12 U Courses, and Post-secondary Access. Paper Presented at the Canadian Society for the Study of Education (CSSE), Vancouver, British Columbia, June 2019.
- Example. C: The U of T-TDSB and York- TDSB Studies (Slides 10-16). From: i) Brown, R. S., Davies, S., & Chakraborty, N. (2019). The University of Toronto-Toronto District School Board Cohort Analysis Report 1: Introductory Findings. Toronto: University of Toronto-Toronto District School Board; ii) Parekh, G., Brown, R.S., & James, C. (2020). Who Comes to York? Access, Participation and Graduation Trends. Toronto: York University. iii) Brown, R.S. (2020). First (Freshmen) year at-risk at York: Findings from the York U-TDSB Dataset. York U: Pre-print Paper.

References from Examples

- Example D: CAT4 National Mathematics Percentiles (Grade 6-8) and University Confirmations (Year 5 Secondary) (Slide 17). Brown, R.S., (2019). Exploratory Analysis of CAT4 Mathematics. TDSB Internal analysis.
- Example E: At Risk Status in Elementary and Grade 9: SK to Post-secondary Study (1999-2013). From: Brown, R., Yau, M., Parekh, G., Xi, Y., & Tam, G. Elementary At-Risk Status and Post-secondary Access in the TDSB, 2000-2013. Paper presented at the SLLS (Society for Longitudinal and Life Course Studies) International Conference, University of Stirling, Scotland, UK, October 2017. See also: Brown, R.S., Gallagher-Mackay, K., Parekh, G. (2020). Redefining risk: Human rights and elementary school factors predicting post-secondary access. Education Policy Analysis Archives, 28 (21).