

The Trajectories of Grade 9 Mathematics Achievement 2008-2013

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Background

- An earlier TDSB Grade 9 Cohort study found that the majority of students who:
 - completed 8 or more credits by the end of Grade 9 had graduated and were attending an Ontario university by the end of 5 years, and
 - students who completed 7 credits had graduated but were not attending a post-secondary institution.
- This presentation examines the different student trajectories over 5 years (from October 31, 2008 to October 31, 2013) according to Grade 9 achievement.

Purpose of the Analysis

- Post-secondary education has become the majority pathway for TDSB students, yet the lack of one Grade 9 credit appeared to greatly reduce that option.

Grade 9 Credit Accumulation	Confirmed University in Ontario	Confirmed College in Ontario	Applied to Post-secondary in Ontario with no Confirmation	Did not Apply to Post-secondary
6 or fewer credits (high risk)	2.7%	8.2%	4.5%	84.6%
7 credits (medium risk)	13.2%	20.6%	11.5%	54.7%
8 or more credits (low risk)	58.6%	13.8%	10.9%	16.8%

Grade 9 Mathematics Mark Distribution

- In the 2008-09 Grade 9 Cohort, 3% of the students did not take a Mathematics credit at all and 12% failed a Mathematics course.
- Failure of a mandatory Grade 9 credit is very problematic. However, there are four categories of failure: not taking Mathematics at all (or dropping/withdrawal), failing with a 0% to 29%, failing with 30% to 39%, and failing with 40% to 49%.

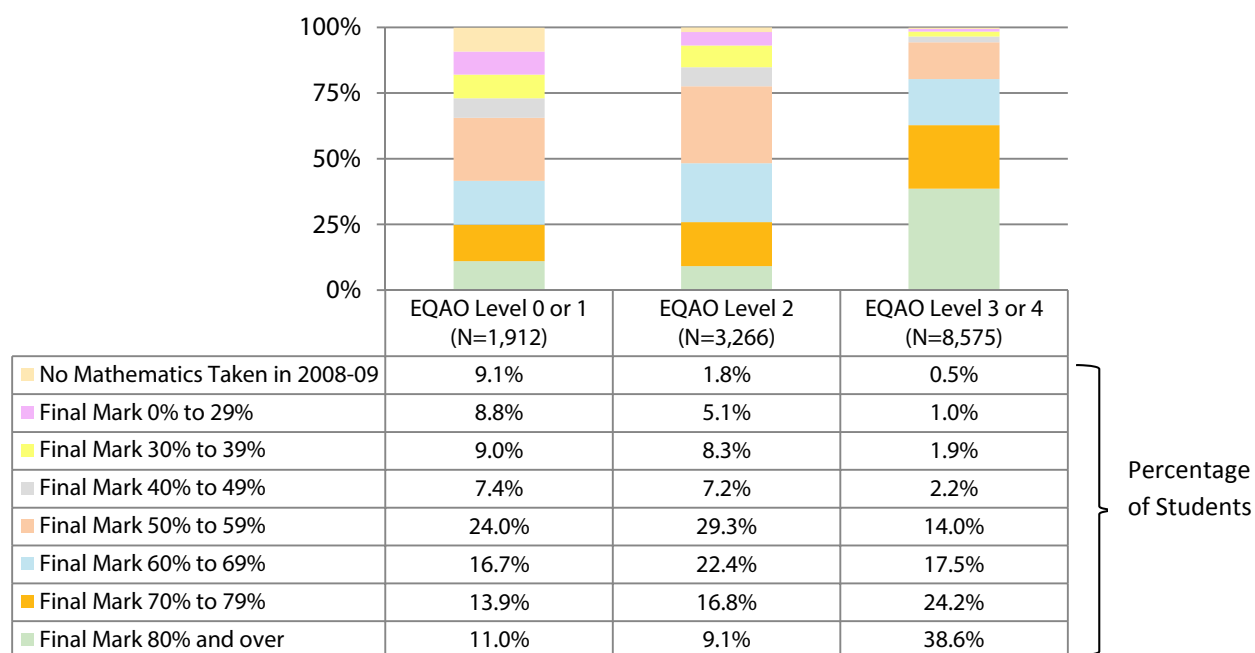
Mathematics Mark	Percent	Cumulative Percent
No Mathematics Taken in 2008-09 (N=423)	2.6%	2.6%
0% to 29% (N=538)	3.3%	11.9%
30% to 39% (N=733)	4.5%	
40% to 49% (N=665)	4.1%	
50% to 59% (N=3,127)	19.1%	85.7%
60% to 69% (N=3,017)	18.4%	
70% to 79% (N=3,352)	20.4%	
80% and over (N=4,554)	27.8%	
Total (N=16,409)	100%	100%

Grade 9 Mathematics Mark Distribution, Graduation, and Post-secondary Confirmations

- Each successive mark category has much higher graduation and post-secondary outcomes. Most students with 30%-49% will graduate but not go to post-secondary.

Mathematics Mark	Graduation	University	College
No Mathematics Taken in 2008-09 (N=423)	29.6%	9.9%	7.8%
0% to 29% (N=538)	28.6%	5.6%	9.1%
30% to 39% (N=733)	52.9%	14.3%	20.3%
40% to 49% (N=665)	66.2%	20.8%	26.0%
50% to 59% (N=3,127)	78.3%	32.5%	24.7%
60% to 69% (N=3,017)	86.6%	45.5%	21.1%
70% to 79% (N=3,352)	91.2%	59.7%	14.3%
80% and over (N=4,554)	96.1%	77.1%	6.7%
Total (N=16,409)	82.9%	50.1%	15.8%

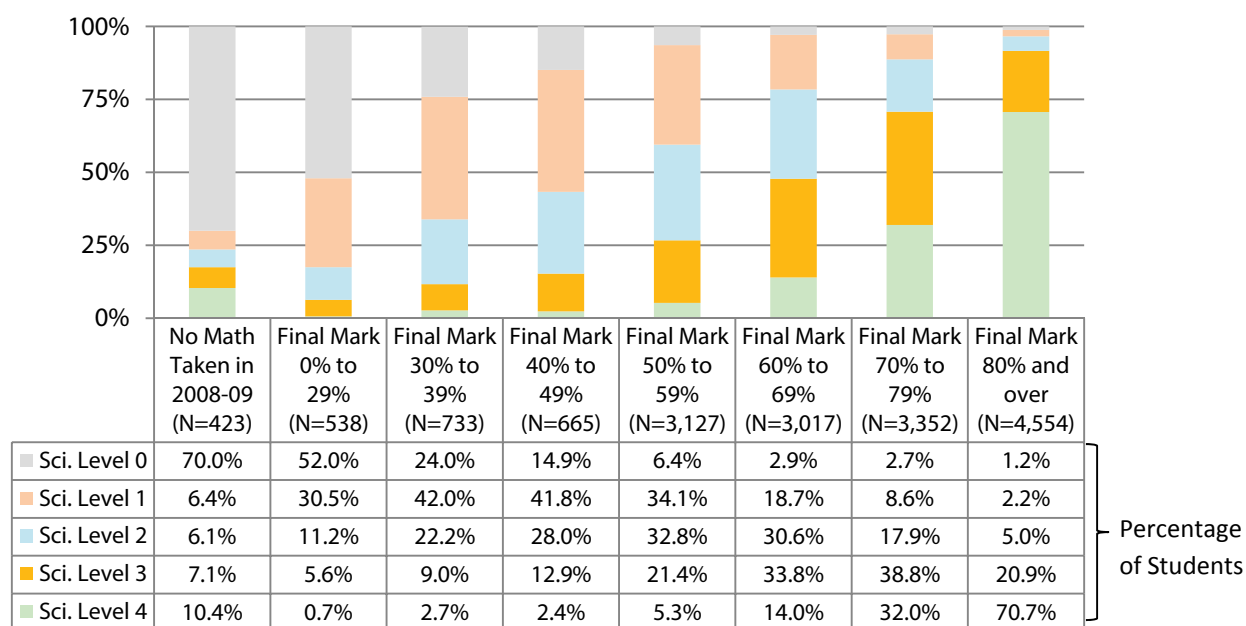
Grade 6 EQAO Mathematics Level and Grade 9 Mathematics Mark Distributions



- Previous achievement (EQAO Mathematics, report card) is a very good measure of general achievement (Level 3 or 4 versus Level 2 or below) but is not a good measure of Grade 9 course failure (or very high course achievement).

Relationship of Grade 9 Mathematics to Grade 9 Science

Grade 9 Mathematics Mark and Grade 9 Science Level Distributions



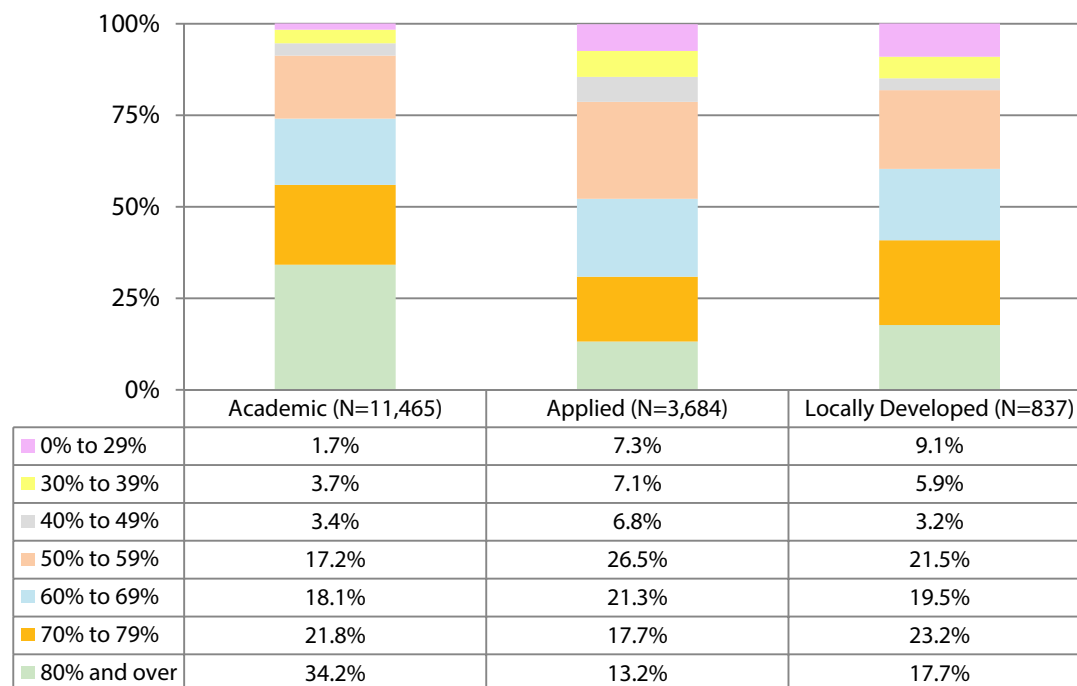
Most students who fail Mathematics will pass most of their other courses. The higher the grade, the more likely students will have passed other courses, even if they failed Mathematics.

Program of Study and Streaming

- In 97% of cases for students taking Academic Mathematics, they are also taking most of their other courses in the Academic Program of Study. The old OS:IS streaming process has been replicated according to the majority of courses taken in Grade 9.

		POS of the Majority of Other Grade 9 Courses			
		Academic	Applied	Essentials	
Grade 9 Mathematics Course	Academic Mathematics (N=11,463)	96.7%	3.2%	0.0%	Percentage of Students
	Applied Mathematics (N=3,682)	21.2%	78.2%	0.6%	
	Locally Developed Mathematics (N=836)	1.2%	34.4%	64.4%	

Program of Study Grade 9 Mathematics Course and Grade 9 Mathematics Mark Distribution

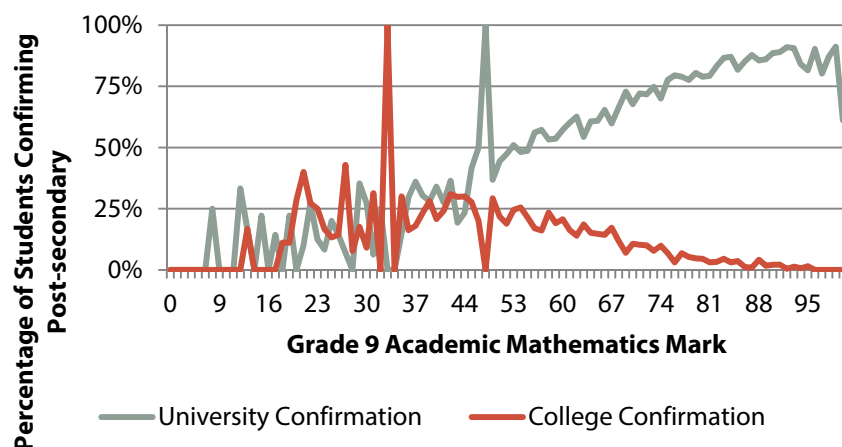


- Grade 9 marks in Mathematics depend upon the Program of Study taken. The range of Academic marks is higher than Applied or Locally Developed (Essentials) marks. Students in Academic are much less likely to fail than those taking non-Academic courses, and those who fail in Academic tend to fail with higher marks, compared to failures in non-Academic courses.

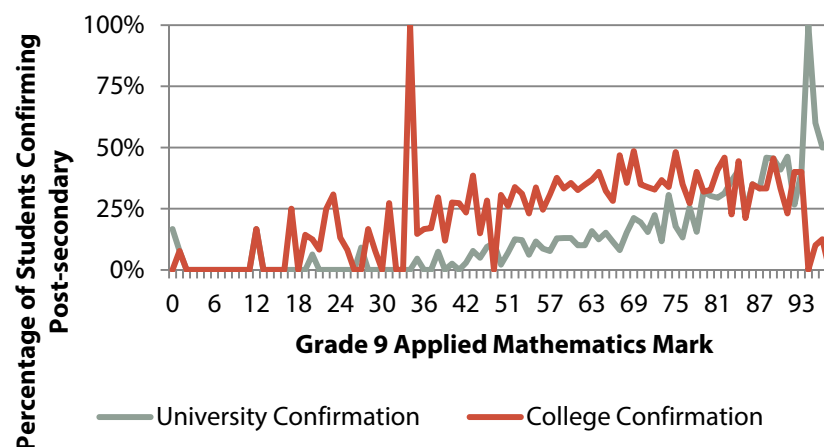
Post-secondary Confirmations and Student Marks

- Marks in non-Academic courses do not have the same value as Academic courses, in terms of going to post-secondary. Students with an 'A' (80% or more) in Grade 9 Applied Mathematics go to post-secondary (college and university) at the same rate as those with a 'D' in Academic Mathematics.

TDSB Students' Grade 9 Academic Mathematics Marks and Five Year Post-secondary Confirmations 2008-13



TDSB Students' Grade 9 Applied Mathematics Marks and Five Year Post-secondary Confirmations 2008-13



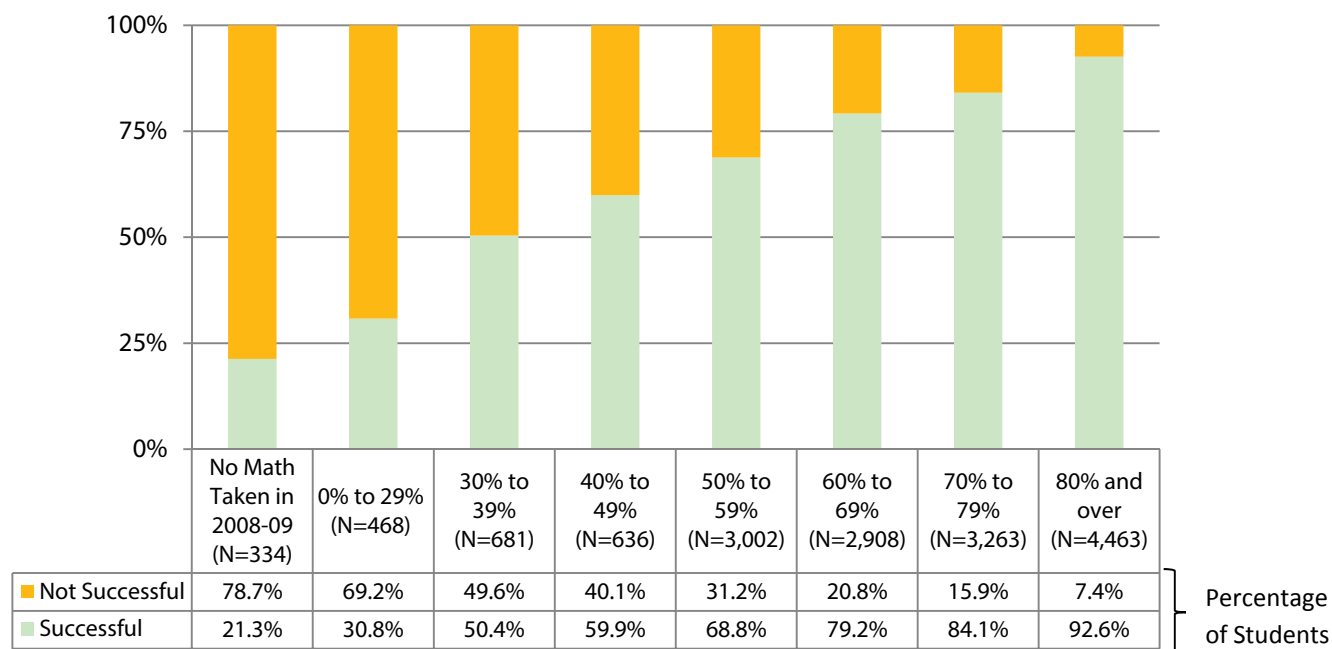
Remediation (Repeating) a Failed Mathematics Course

- Remediation efforts for those who fail Grade 9 Mathematics have limited long-term success: while students may pass Grade 9 Mathematics after remediation, they often do not graduate or go to post-secondary. The most successful outcomes are those who take Grade 9 Summer School immediately after failing in the regular school year. However, most of those students are also those taking Academic courses and/or failing with a higher mark. It is therefore difficult to disaggregate remediation from streaming.

Type of Remediation	Failed Grade 9 Mathematics: Mark of 40% to 49%	Taking Academic Mathematics	Graduation	University	College
Summer School 2008-09 (N=702)	54.8%	74.9%	74.2%	24.6%	27.5%
Credit Recovery (N=257)	35.0%	32.3%	34.2%	6.2%	14.0%
Regular Day School 2009-10 or later (N=626)	21.4%	45.8%	47.1%	10.5%	17.9%
Other Pathway (N=351)	16.0%	29.9%	22.2%	5.1%	8.5%

Relationship of Grade 9 Mathematics to the Grade 10 Literacy Test

Grade 9 Mathematics Mark and Grade 10 OSSLT



- The relationship of Grade 9 Mathematics marks to Grade 10 literacy (OSSLT) results is very strong, showing the interaction of numeracy and literacy measures.

Conclusion

- At this time it is difficult to successfully use previous elementary achievement to predict Grade 9 subject failure (versus those with generally lower achievement, who will pass).
- Generally, the higher the mark, the better the long-term outcome, even for those who fail (higher failure has better long-term success than lower failure).
- However, Program of Study (streaming) appears to make the patterns more complex. Students in non-Academic programming have much lower marks than those taking Academic - they are less likely to have an 'A' or 'B', they are more likely to fail, and they are more likely to fail with a lower mark. Efficacy of their remediation efforts are unclear (they may pass Grade 9 Mathematics through a later attempt but not to finish needed Mathematics requirements for post-secondary). Marks of non-Academic courses seem not to have the same value as Academic marks in terms of post-secondary attainment (e.g. an 'A' in Applied Mathematics is worth a 'D' in Academic Mathematics).



Post-secondary Pathways: Demographic and Socio-economic Characteristics, Institution, and Post-secondary Study

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Background

- This presentation examines key demographics and socio-economic variables, post-secondary institution and, Program Type for post-secondary pathways.
- Data from the Toronto District School Board (TDSB) Grade 9 cohorts was merged with
 - A) All Ontario Universities' Applications Centre (OUAC) confirmations from 2008 through 2014, and
 - B) All Ontario College Application Service (OCAS) confirmations from 2008 through 2014.

Overall Picture

- Out of 97,800 students, 47,517 or 49% confirmed an offer of admission from an Ontario university while 16,425 or 17% confirmed an offer from an Ontario college.

	Confirmed University in Ontario		Confirmed College in Ontario		Applied to Post-secondary in Ontario with no Confirmation		Did not apply to Post-secondary	
	# of students	% of students	# of students	% of students	# of students	% of students	# of students	% of students
2004-08 to 2010-14 cohorts (N=97,800)	41,517	48.6%	16,425	16.8%	10,033	10.3%	23,825	24.4%

Overall Picture Cont'd

- University students are more likely to be female while college students are more likely to be male.
- Students attending university are less likely to speak English only compared to college students and were much less likely to be students with Special Education Needs (SEN) excluding Gifted.

	Gender (% of students)		Language (% of students)	SEN (% of students)
	Female	Male	English	SEN excluding Gifted
Confirmed University in Ontario	53.6%	46.4%	37.4%	4.6%
Confirmed College in Ontario	47%	53%	52.5%	22.5%
Applied to Post-secondary in Ontario with no Confirmation	48.5%	51.5%	55.1%	13.8%
Did not apply to Post-secondary	38.1%	61.9%	64%	29.5%

Overall Picture Cont'd

- A majority of both university and college confirming students took Academic programs in Grade 9, but 95% of university students did compared to 55% of college students.
- We have found Grade 9 Mathematics course achievement to be a powerful predictor of post-secondary access.

(Source: Brown, R.S., Newton, L., Tam, G., & Parekh, G. (2015). The trajectories of grade 9 mathematics achievement 2008-2013. (Research Report No. 15/16-05). Toronto, Ontario, Canada: Toronto District School Board)

- Over two-thirds of university-bound students were at Levels 3 or 4 in Grade 9 Mathematics, compared to 31% of college-bound students.
- University-bound students were somewhat more likely to be in the highest tertile of income compared to college-bound students.

	Program of Study (% of students)	Grade 9 Mathematics (% of students)	Income (% of students)
	Academic	Levels 3 & 4	Highest income tertile
Confirmed University in Ontario	94.7%	68.5%	38.8%
Confirmed College in Ontario	55.2%	30.8%	27.7%
Applied to Post-secondary in Ontario with no Confirmation	76%	45%	38%
Did not apply to Post-secondary	40%	21.8%	33.3%

Post-secondary Institution

- The majority of TDSB cohort students attended local universities and colleges, while University of Waterloo and University of Guelph, two other popular universities, are around an hour's drive from Toronto.

Post-secondary Institution	Attendance (% of students)
1. University of Toronto	19.3%
2. York University	13%
3. Ryerson University	11.3%
4. GEORGE BROWN COLLEGE	6.6%
5. University of Waterloo	6.1%
6. CENTENNIAL COLLEGE	5.6%
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. FANSHAW 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%

Post-secondary Institution Cont'd

- Generally universities had more female students and colleges had more male students but two universities had over 60% male students.
- There were wide differences amongst universities in terms of student language.
- All universities had fewer than 10% of students with SEN excluding Gifted; in contrast 21-25% of colleges were comprised of students with SEN excluding Gifted.

Post-secondary Institution	Gender (% of students)		Language (% of students)	SEN (% of students)
	Female	Male		
1. University of Toronto	57%	43%	29.1%	3.3%
2. York University	59.5%	40.5%	30.5%	5.5%
3. Ryerson University	49.7%	50.3%	30.3%	5.2%
4. GEORGE BROWN COLLEGE	49.9%	50.1%	52.7%	21.3%
5. University of Waterloo	38.7%	61.3%	22.1%	1.6%
6. CENTENNIAL COLLEGE	43.4%	56.6%	51.6%	25%
7. SENECA COLLEGE	47.5%	52.5%	39.7%	21.7%
8. HUMBER COLLEGE	47.8%	52.2%	57.6%	21.1%
9. University of Guelph	56.3%	43.7%	67.6%	6.7%
10. University of Western Ontario	53.5%	46.5%	52.8%	3.1%
11. McMaster University	51.6%	48.4%	36.5%	2.6%
12. Queen's University	62.1%	37.9%	67.7%	3%
13. Wilfred Laurier University	49.4%	50.6%	60.8%	6.6%
14. University of Ontario Institute of Technology	32.7%	67.3%	25.7%	6.2%

Post-secondary Institution Cont'd

- For each university, over 90% of students took Academic courses in Grade 9. The only college with less than half of the students taking Academic courses was Centennial College.
- The proportion of students at Levels 3 or 4 in Grade 9 Mathematics ranged from 29% to 91%.
- There was a wide range of students living in the highest tertile of income.

Post-secondary Institution	Program of Study (% of students)	Grade 9 Mathematics (% of students)	Income (% of students)
	Academic	Levels 3 & 4	Highest income tertile
1. University of Toronto	95.8%	76.2%	34.8%
2. York University	91.2%	54.6%	28.5%
3. Ryerson University	93.5%	61.1%	31.3%
4. GEORGE BROWN COLLEGE	59.8%	30.4%	26.7%
5. University of Waterloo	97.4%	90.5%	38.7%
6. CENTENNIAL COLLEGE	44.5%	31%	27.1%
7. SENECA COLLEGE	54.2%	32.4%	25%
8. HUMBER COLLEGE	59.5%	28.8%	26.5%
9. University of Guelph	95.1%	61.7%	53.2%
10. University of Western Ontario	98.7%	79.2%	58.1%
11. McMaster University	97%	82.9%	43.8%
12. Queen's University	99.5%	83.7%	63.2%
13. Wilfred Laurier University	97.2%	61.1%	56.5%
14. University of Ontario Institute of Technology	87.9%	53.3%	34%

Type of Post-secondary Study

- While a majority of students got their first choice in post-secondary institution in every program type, over 80% of the students taking technology in college got their first choice in post-secondary institution.
- Just over half of those students taking commerce, management, and business administration in university got their first choice in post-secondary institution.
- Overall, a higher percentage of students attending college confirmed their first choices for institution and program compared to students attending university.

Program	Institution Choice (% of students)		Program Choice (% of students)	
	First Choice	Not First Choice	First Choice	Not First Choice
Arts: Humanities and Social Science	61.2%	38.8%	75.2%	24.8%
Science	59.4%	40.6%	77.6%	22.4%
Commerce, Management and Business Administration	55.7%	44.3%	77.5%	22.5%
Physical and Health Education and Recreation	56.7%	43.3%	60.1%	39.9%
Engineering and Applied Science	56.2%	43.8%	88.9%	11.1%
Fine and Applied Arts	69.5%	30.5%	80.3%	19.7%
College – APPLIED ARTS	75.2%	24.8%	90.5%	9.5%
College – BUSINESS	78%	22%	84.5%	15.5%
College – HEALTH	67.7%	32.3%	84.8%	15.2%
College – TECHNOLOGY	80.5%	19.5%	90.8%	9.2%

Type of Post-secondary Study Cont'd

- Most programs had more female students, but engineering and applied science in university and technology in college had over 80% male students.
- There were wide differences amongst programs in terms of student language.
- All programs at universities had fewer than 10% of students with SEN excluding Gifted; in contrast 17-25% of college programs were comprised of students with SEN excluding Gifted.

Program	Gender (% of students)		Language (% of students)	SEN (% of students)
	Female	Male	English	SEN excluding Gifted
Arts: Humanities and Social Science	63.3%	36.7%	48.7%	6.1%
Science	52.8%	47.2%	26.6%	2.8%
Commerce, Management and Business Administration	42.2%	57.8%	27.8%	4.1%
Physical and Health Education and Recreation	58.5%	41.5%	48.1%	4.9%
Engineering and Applied Science	16.3%	83.7%	26.5%	2.4%
Fine and Applied Arts	66.6%	33.4%	50.9%	8.7%
College – APPLIED ARTS	60.4%	39.6%	60%	25.4%
College – BUSINESS	49.1%	50.9%	44.3%	19.7%
College – HEALTH	68.8%	31.2%	54%	16.6%
College – TECHNOLOGY	9.5%	90.5%	47.7%	22.6%

Type of Post-secondary Study Cont'd

- For each university program, over 90% of students took Academic courses in Grade 9, though all college programs had over half of students taking Academic.
- The proportion of students at Levels 3 or 4 in Grade 9 Mathematics ranged from 28% to 90%.
- There was a range of students living in the highest tertile of income from 26% to 43%.

Program	Program of Study (% of students)	Grade 9 Mathematics (% of students)	Income (% of students)
	Academic	Levels 3 & 4	Highest income tertile
Arts: Humanities and Social Science	93%	51.7%	40.5%
Science	96.6%	84.1%	35.6%
Commerce, Management and Business Administration	94.6%	72.4%	38.2%
Physical and Health Education and Recreation	95.8%	67%	42.6%
Engineering and Applied Science	96.7%	89.5%	36.6%
Fine and Applied Arts	91.3%	54.4%	41.8%
College – APPLIED ARTS	53.2%	27.9%	27.3%
College – BUSINESS	56.6%	29.9%	26.4%
College – HEALTH	59.7%	37.5%	26.6%
College – TECHNOLOGY	55.5%	35.3%	30.3%





Transition to Higher Education in Three Gateway Cities: the combined effects of Class, Gender and Race

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(York University), Robert S. Brown
(Toronto District School Board), Jenny
Nagaoka (University of Chicago)



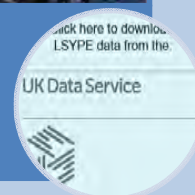
Toronto



Chicago



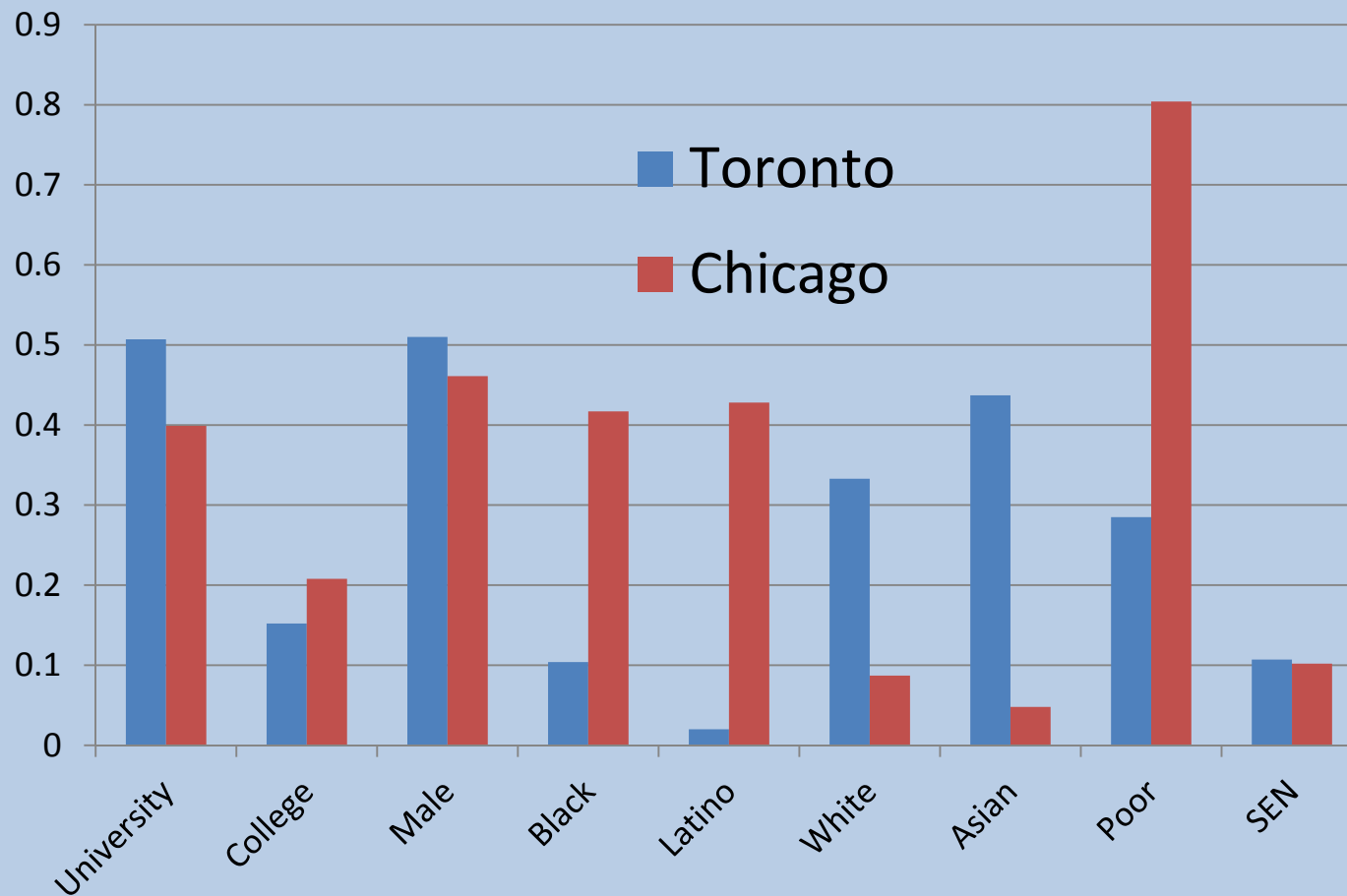
London



Chicago and Toronto

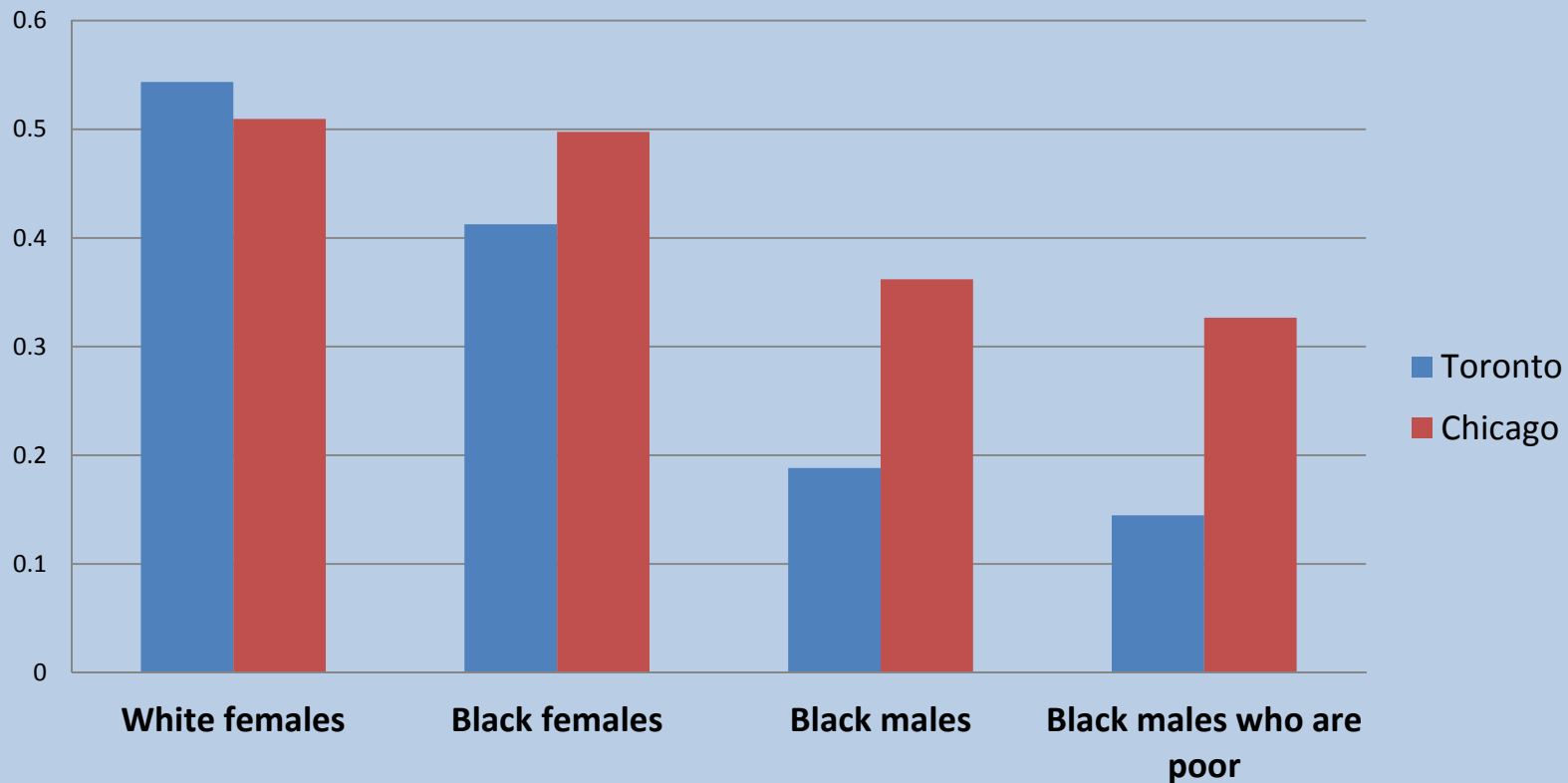
- Chicago Public Schools (CPS) oversees 681 schools, serving 400,000 students.
- Toronto District School Board (TDSB) oversees around 600 schools serving 250,000 students
- City of Chicago population 2,707,120 (2011 Census)
- City of Toronto population 2,791,140 (2011 Census)
- Chicago 65% percent for the 2012–2013 school year
- Toronto's comparable graduation rate was 66%

Some comparisons with Chicago



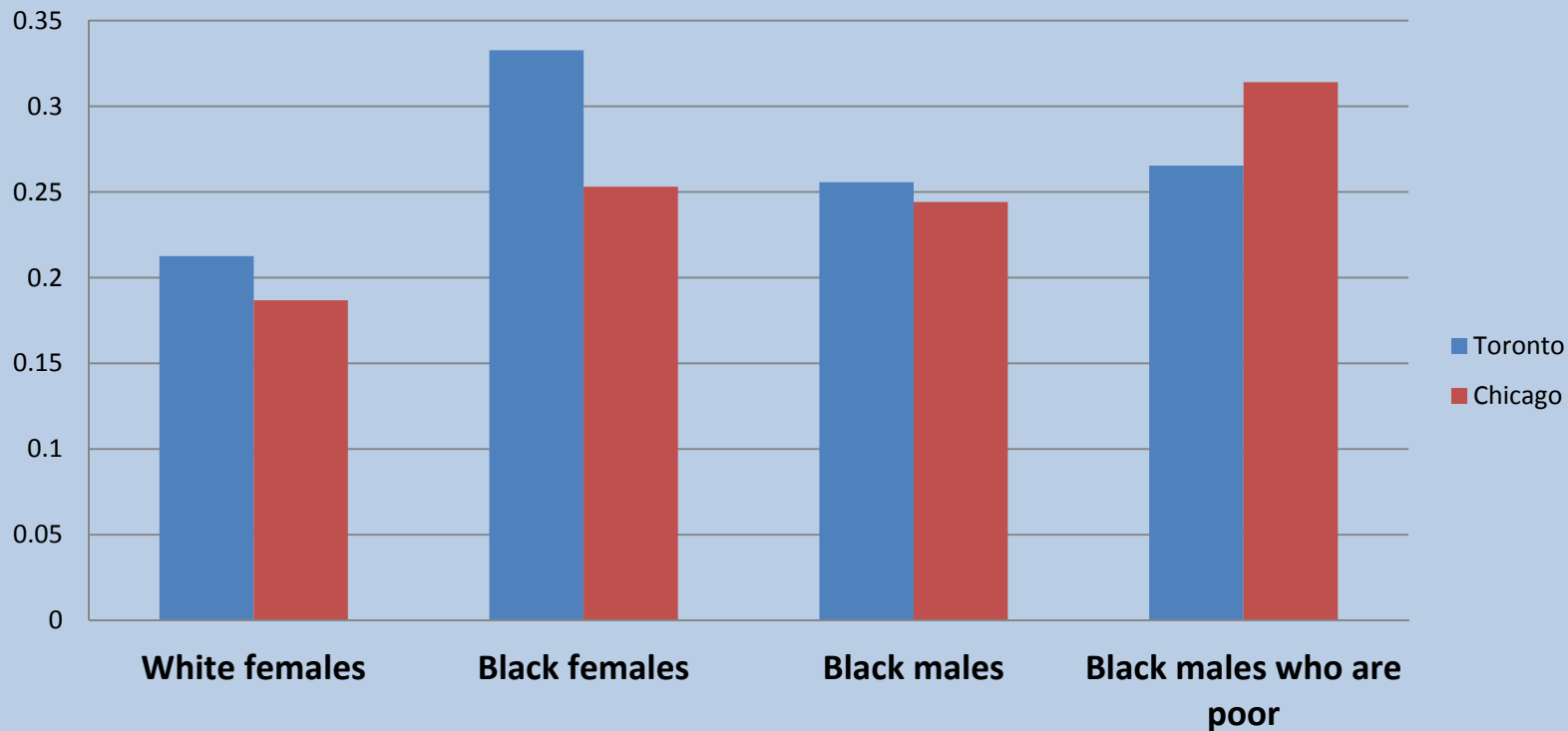
Some predicted probabilities

Probability of Going to University



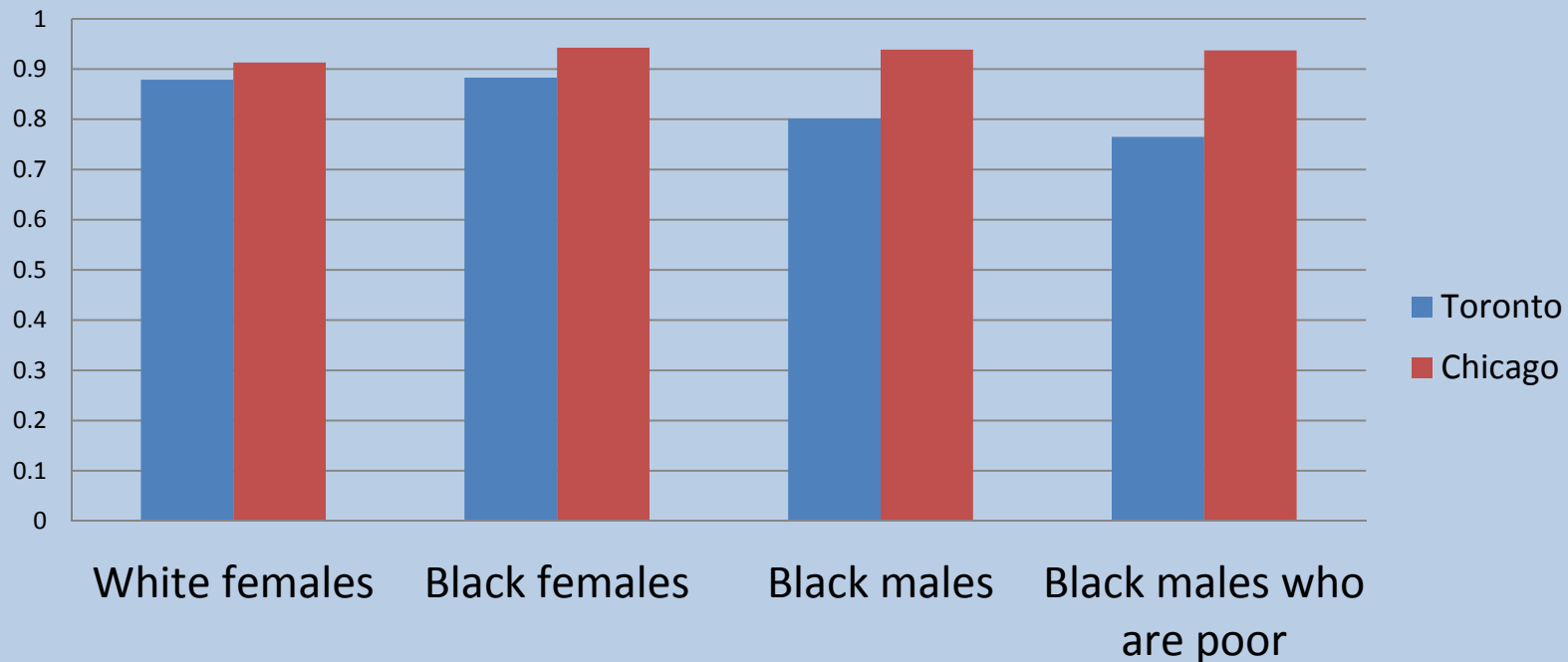
Some more predicted probabilities

**Probability of Going to College by Selected Race, Sex,
and Income Characteristics**



Even more predicted probabilities

**Probability of Going to University if Student has 4.0 GPA
by Selected Race, Sex, and Income Characteristics**

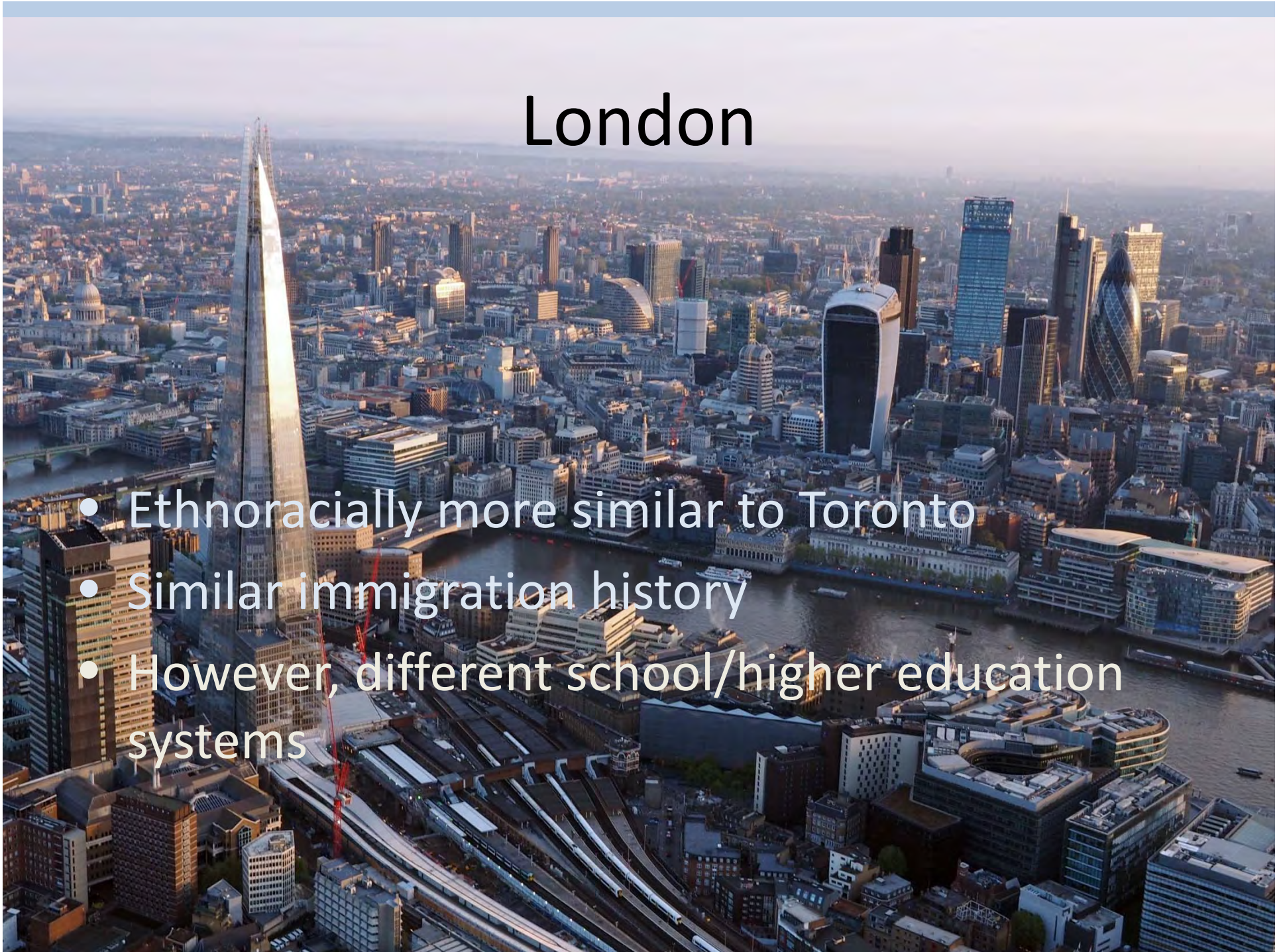


Important contextual differences

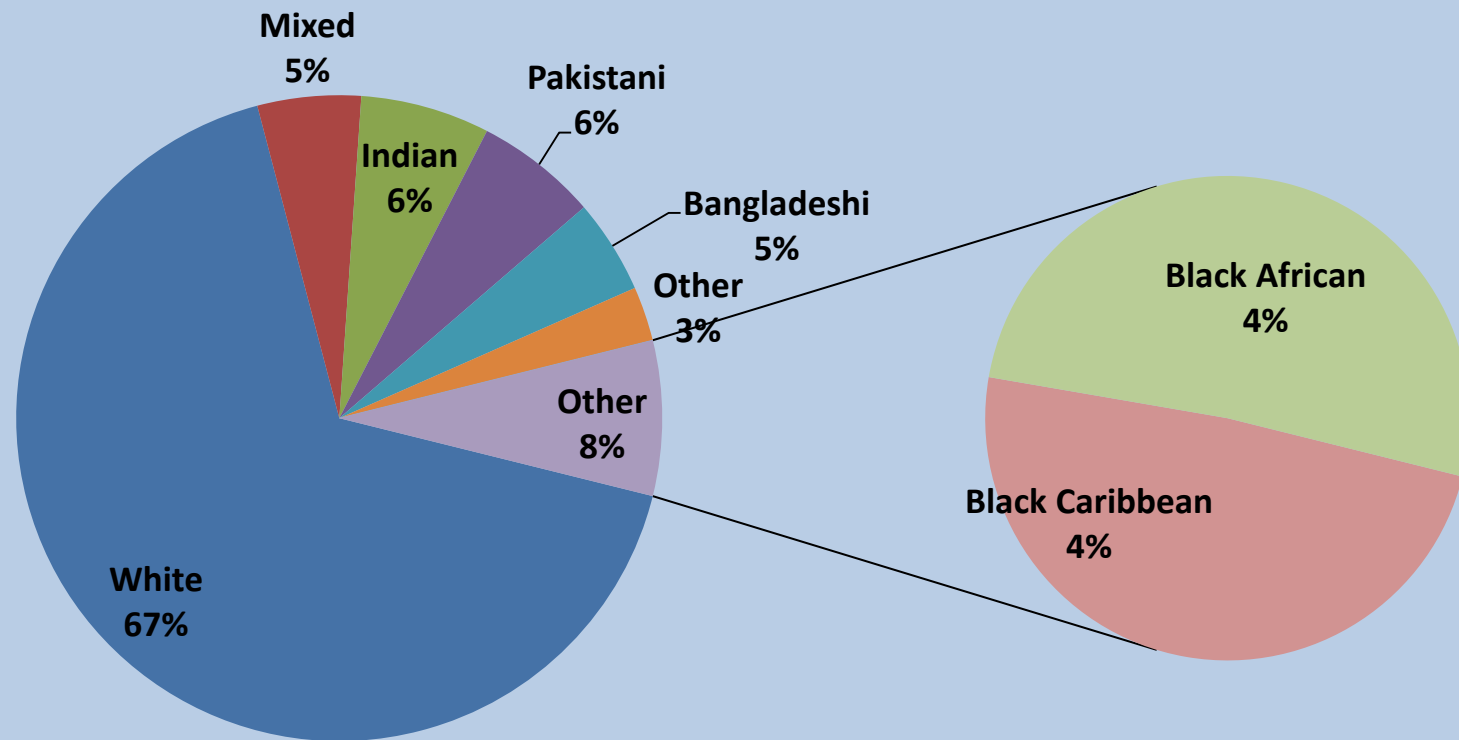
1. Over half of all eligible white students go to private school in Chicago
2. Chicago Public Schools phased out “streaming” about a decade ago
3. “College coach” program a recent program in CPS
4. Blacks in Chicago are African American, third generation or higher

London

- Ethnoracially more similar to Toronto
- Similar immigration history
- However, different school/higher education systems

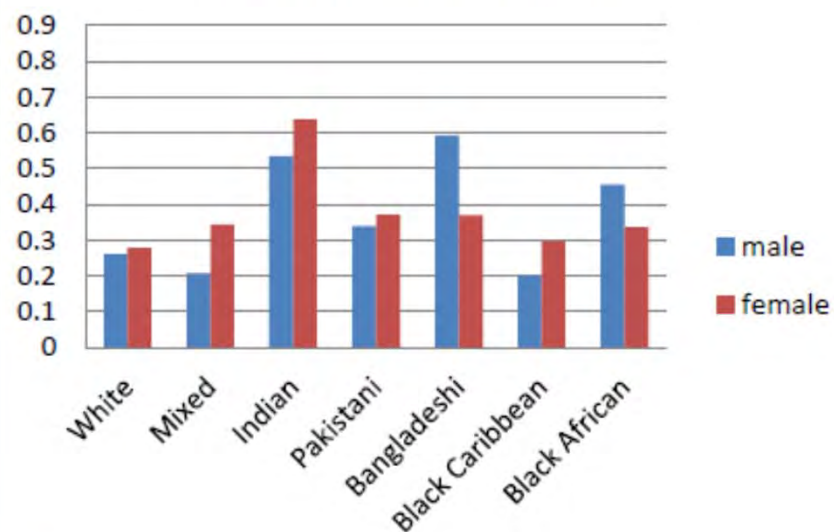


Ethno-racial composition of London sample

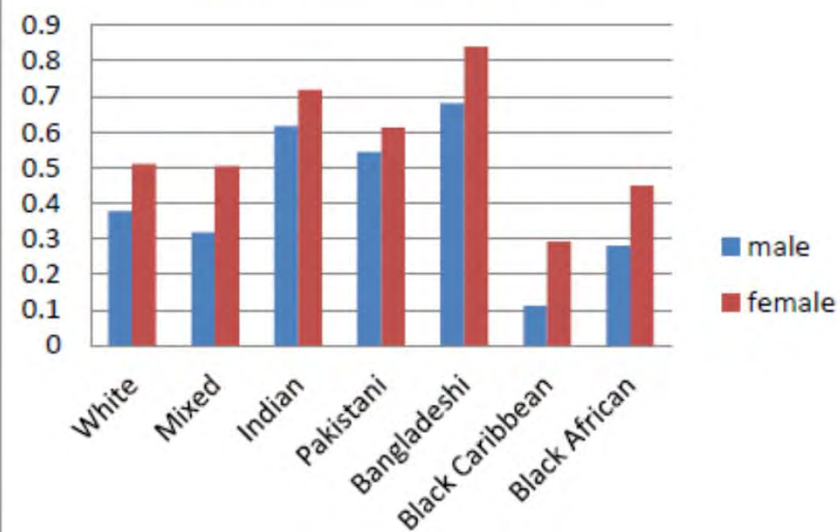


Data: London respondents in LSYPE, Waves 1 to 7

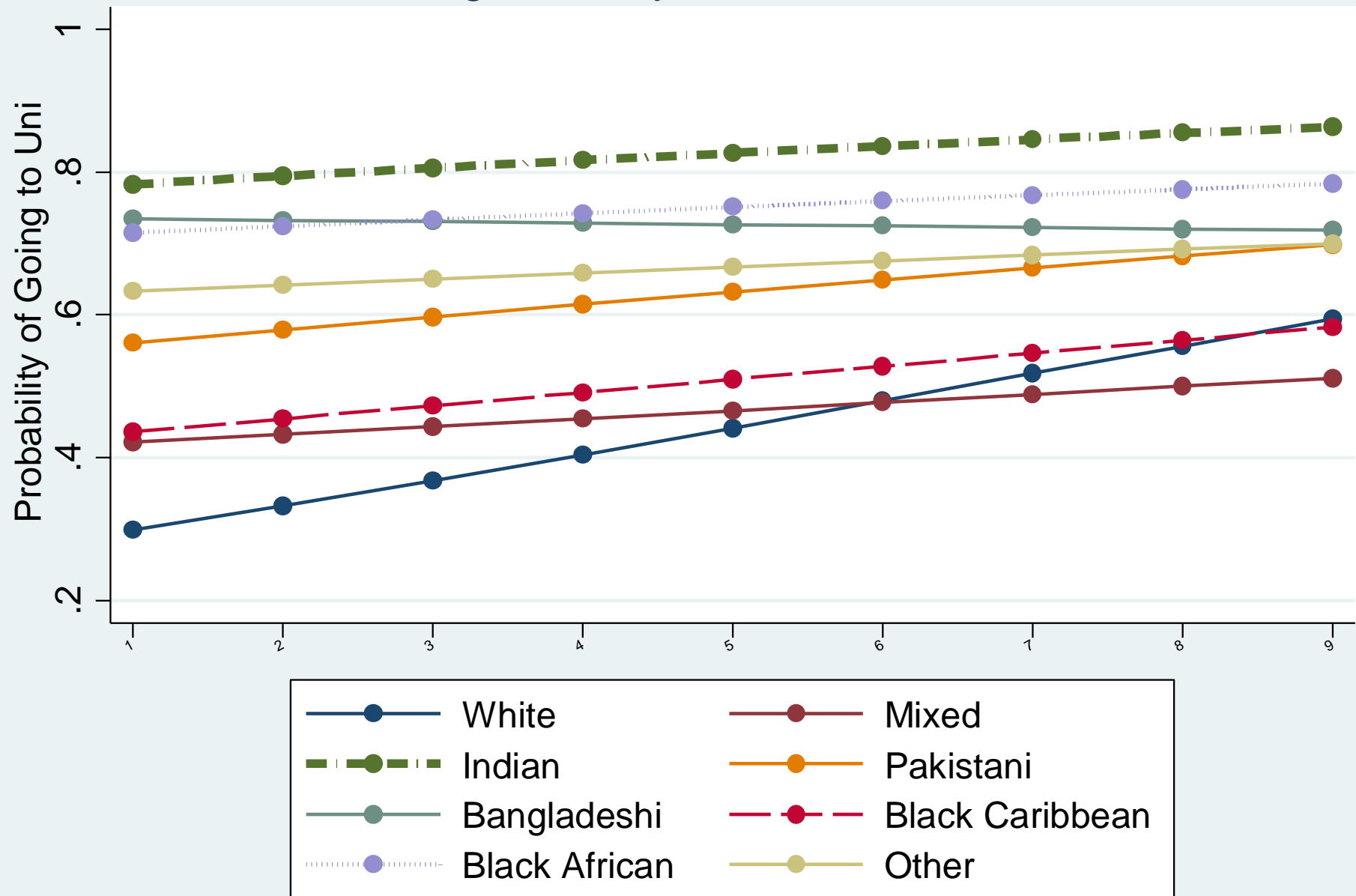
Probability of University, London Sample



Probability of Confirming University, Toronto



Going to Uni by Race and Class



- Race and class interactions much more important in London than Toronto (less variation in income among racialized groups)
- Race and gender more important in Toronto
- Pronounced difference in outcomes in terms of a white (male) underclass in London having lowest likelihood of FE

New research with MTCU

- Comparisons of 2006 and 2011 Toronto cohorts
- Encouraging – GOOD NEWS
- Suggestions that there have been improvements in Toronto for racialized youth.

Thank you!

- klrobson@yorku.ca



gatewaycitiesproject.info.yorku.ca