Beyond the Bar:
Advance Visual Graphic Techniques

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DePaul University

Agenda

- DePaul Context

- Challenge

- Good Graphic Design

- Advanced Graphs

- Super graphic

The DePaul Context

- 110 years of urban, Catholic, Vincentian tradition

- Today, enrollment of 25,000 students;

- 9 colleges and 8 campuses in Chicagoland area

- Largest & fastest growing Catholic university in U.S.

- 8th largest private not-for-profit university

- The largest provider of master's level graduate education in Illinois

The Challenge

- NSSE data → Bar graphs
- Surveys → More bar graphs
- Academic data (admission, retention) → Bar graphs again (or line chart perhaps?)
- Demographic → Bar graphs

Tips? Synthesize your information and create a multi-dimension graphic displays to provide quicker access to meaningful insights.

Good graphic design
(Steven Kosslyn)

1. Connect with Your Audience

- Relevance: neither too much or too little
- Appropriate knowledge: prior knowledge of concept

2. Direct and Hold Attention

- Salience: attention to differences
- Discriminability: differences must be noticeable
- Perceptual Organization: people automatically group
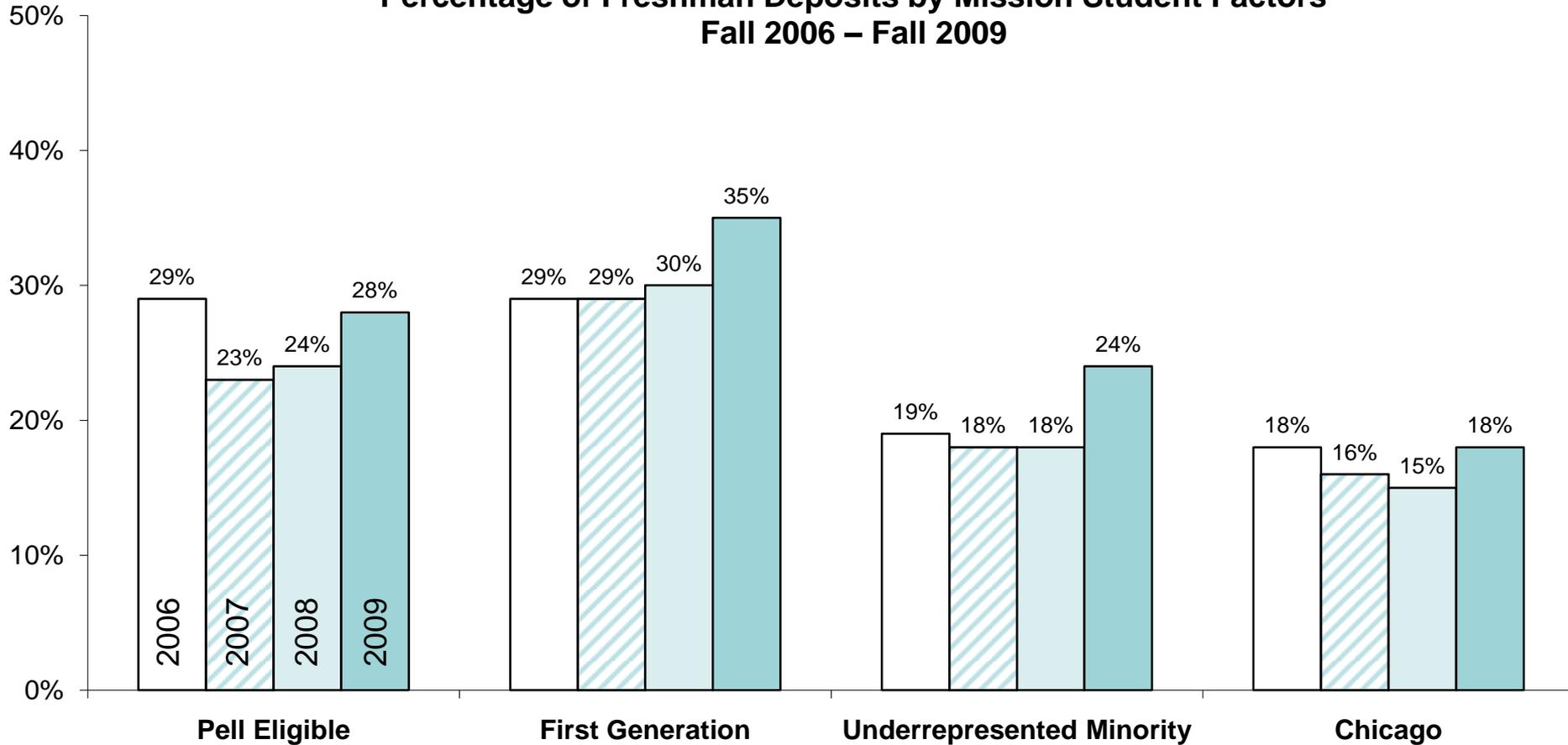
3. Promote Understanding and Memory

- Compatibility: message compatible with meaning
- Informative Changes: changes expected to carry meaning
- Capacity Limitations: people can only remember so much
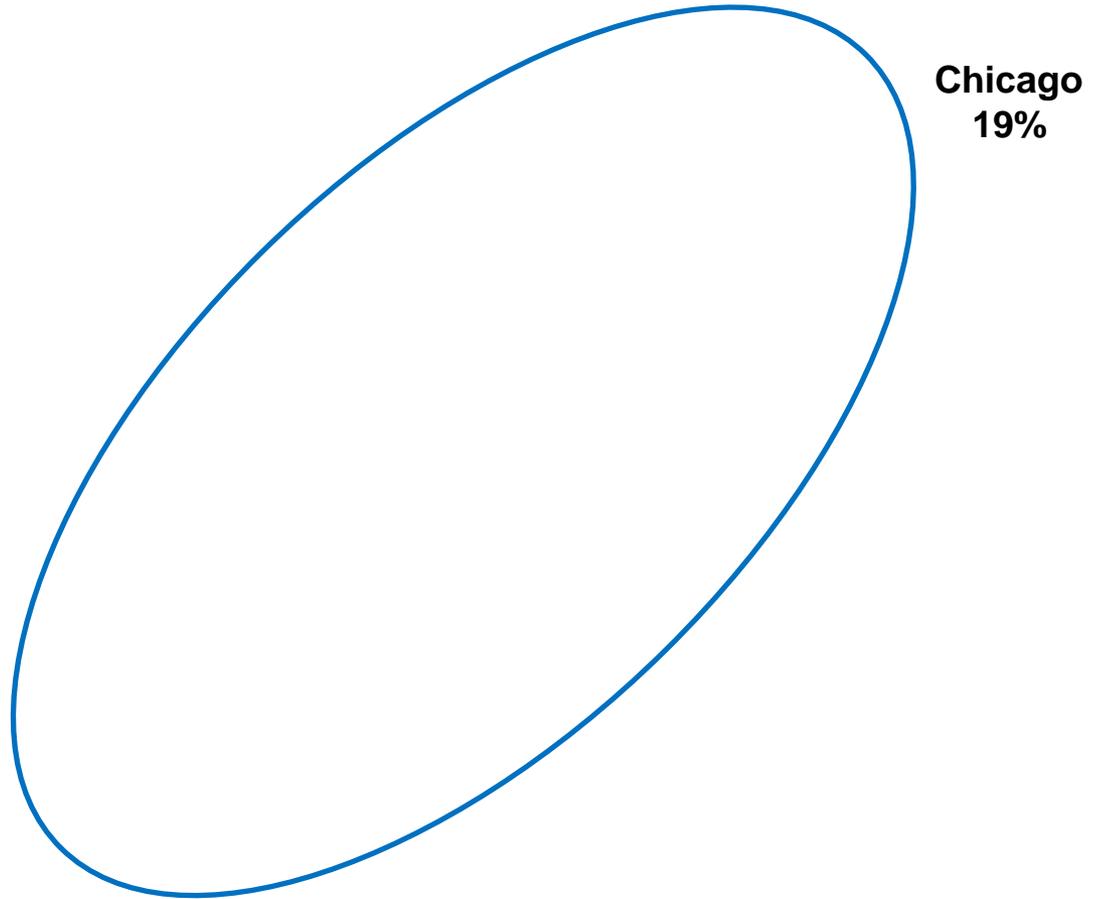
Advanced Graphs

BEFORE

The four factors below are typically used to identify mission students, and each separately accounts for 20-30% of the freshman class. But how much do these factors overlap?

Percentage of Freshman Deposits by Mission Student Factors
Fall 2006 – Fall 2009
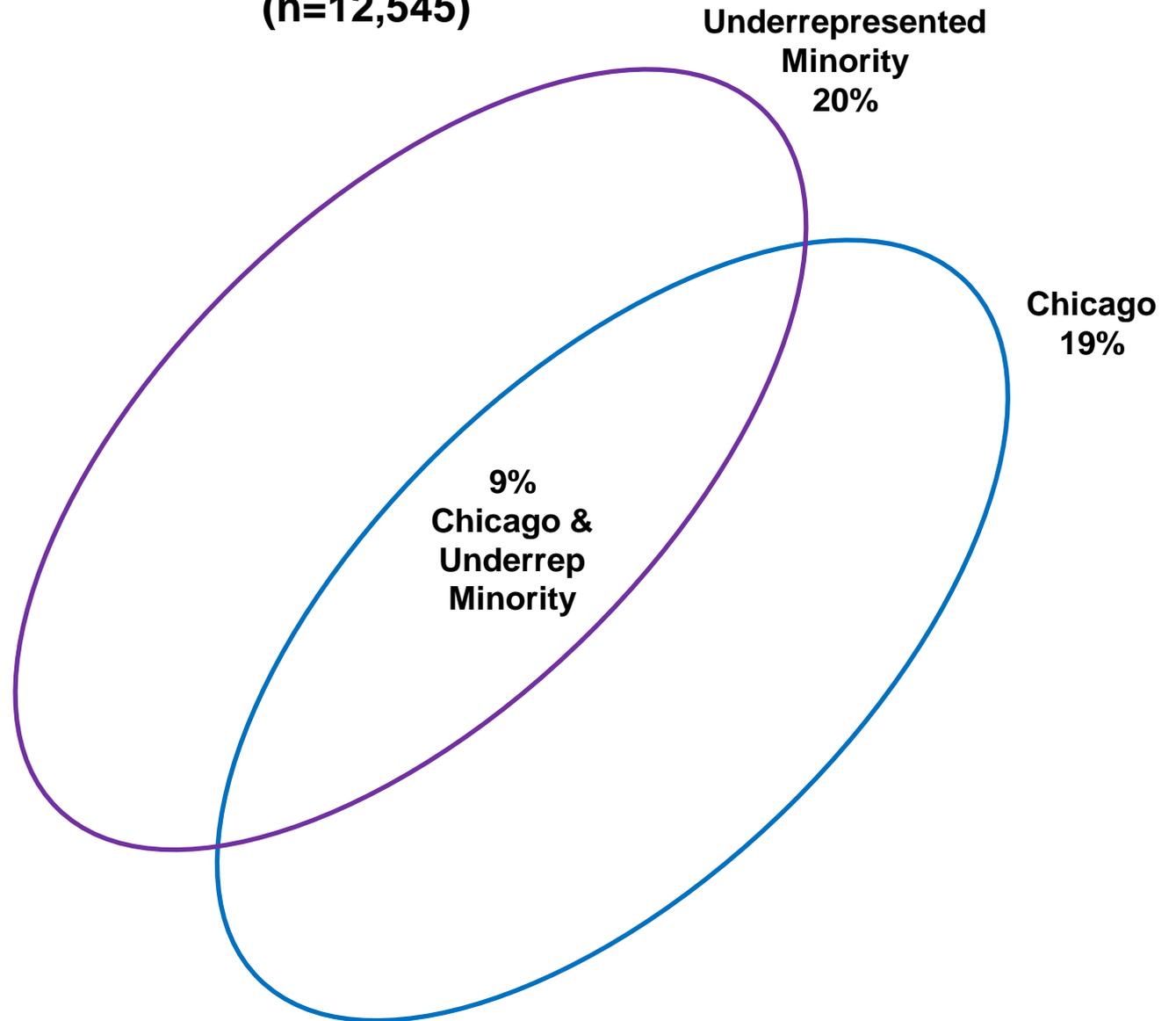
Pell Eligible: 2006 29%, 2007 23%, 2008 24%, 2009 28%

First Generation: 2006 29%, 2007 29%, 2008 30%, 2009 35%

Underrepresented Minority: 2006 19%, 2007 18%, 2008 18%, 2009 24%

Chicago: 2006 18%, 2007 16%, 2008 15%, 2009 18%

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2005-2009 Enrolled Freshmen
(n=12,545)

**Chicago
19%**

2005-2009 Enrolled Freshmen (n=12,545)

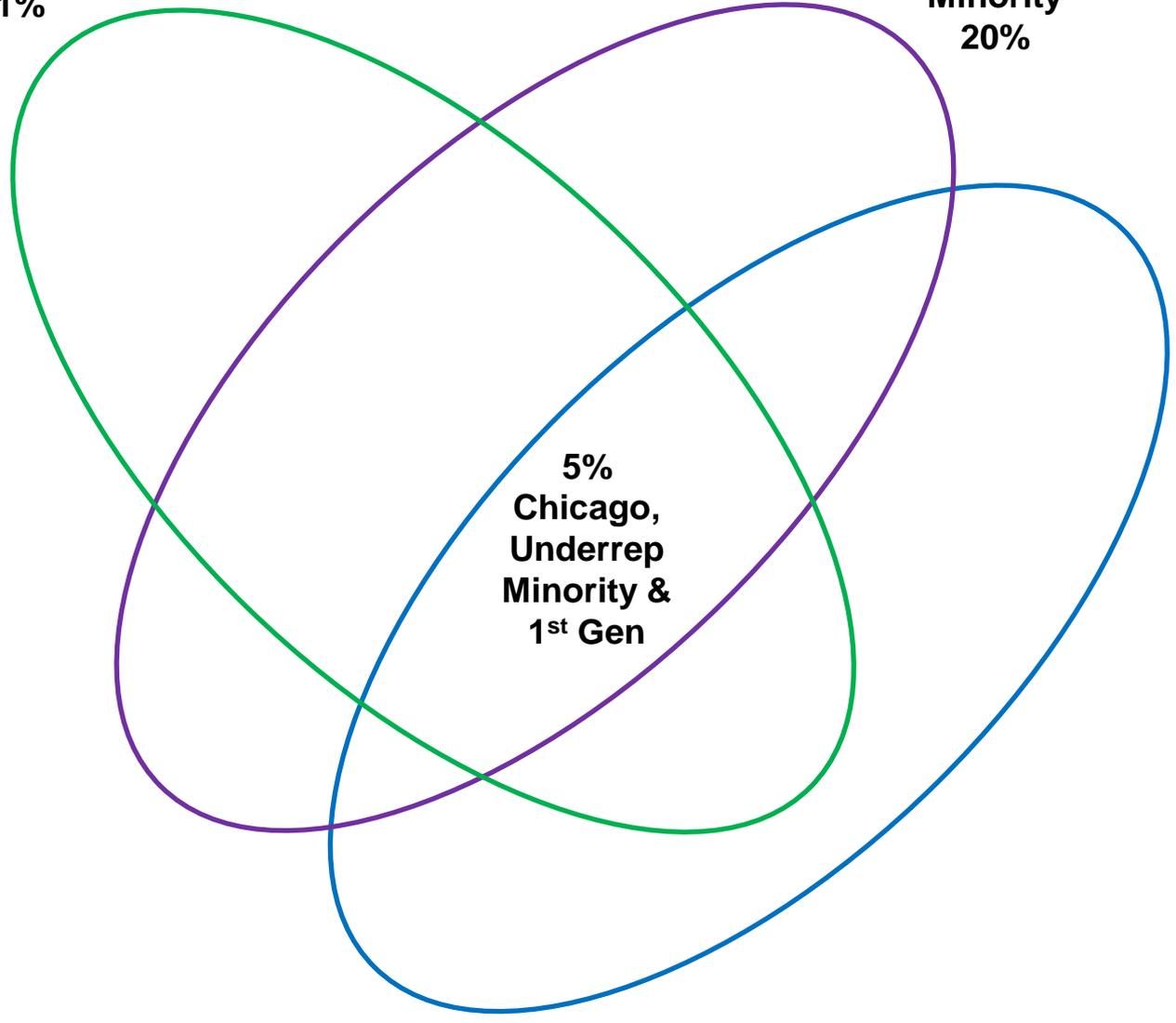Underrepresented Minority 20%

Chicago 19%

9% Chicago & Underrep Minority

2005-2009 Enrolled Freshmen (n=12,545)

First Generation 31% · Underrepresented Minority 20% · Chicago 19% · 5% Chicago, Underrep Minority & 1st Gen
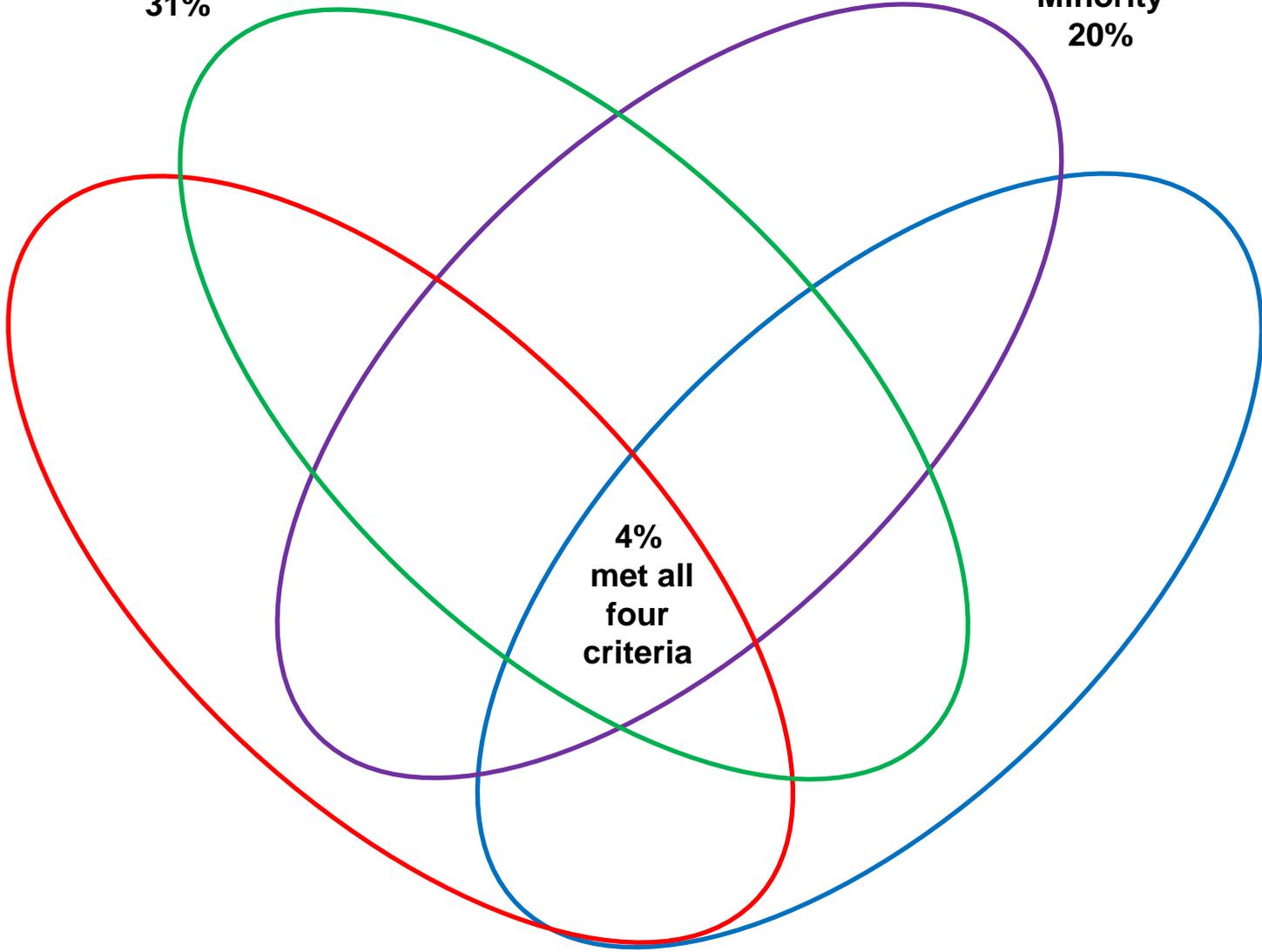
2005-2008 Enrolled Freshmen (n=12,545)

First Generation 31%
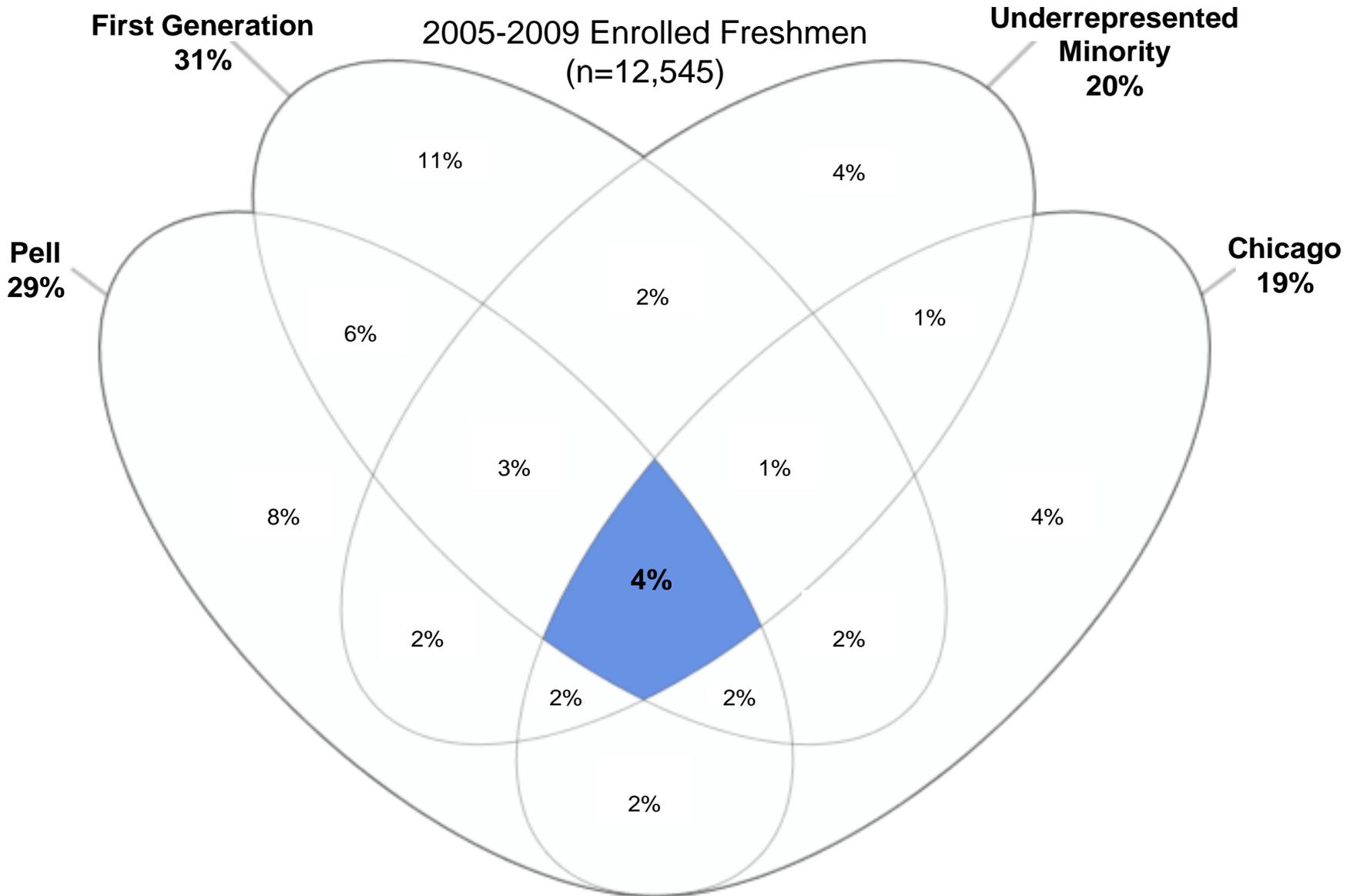
Underrepresented Minority 20%

Pell 29%

Chicago 19%

4% met all four criteria

AFTER

Venn diagrams are great visual tools to quickly and easily show the relationships between multiple variables.

First Generation 31%

2005-2009 Enrolled Freshmen (n=12,545)

Underrepresented Minority 20%

Pell 29%

Chicago 19%

11%

4%

6%

2%

1%

3%

1%

8%

4%

4%

2%

2%

2%

2%

2%

BEFORE Bar charts can show applications/admits/enrollments at one point in time, but it's difficult to see trends over the whole term.

LA&S App, Admit, Deposit and Enrollment Volume 2005 - 2009

DEPAUL UNIVERSITY
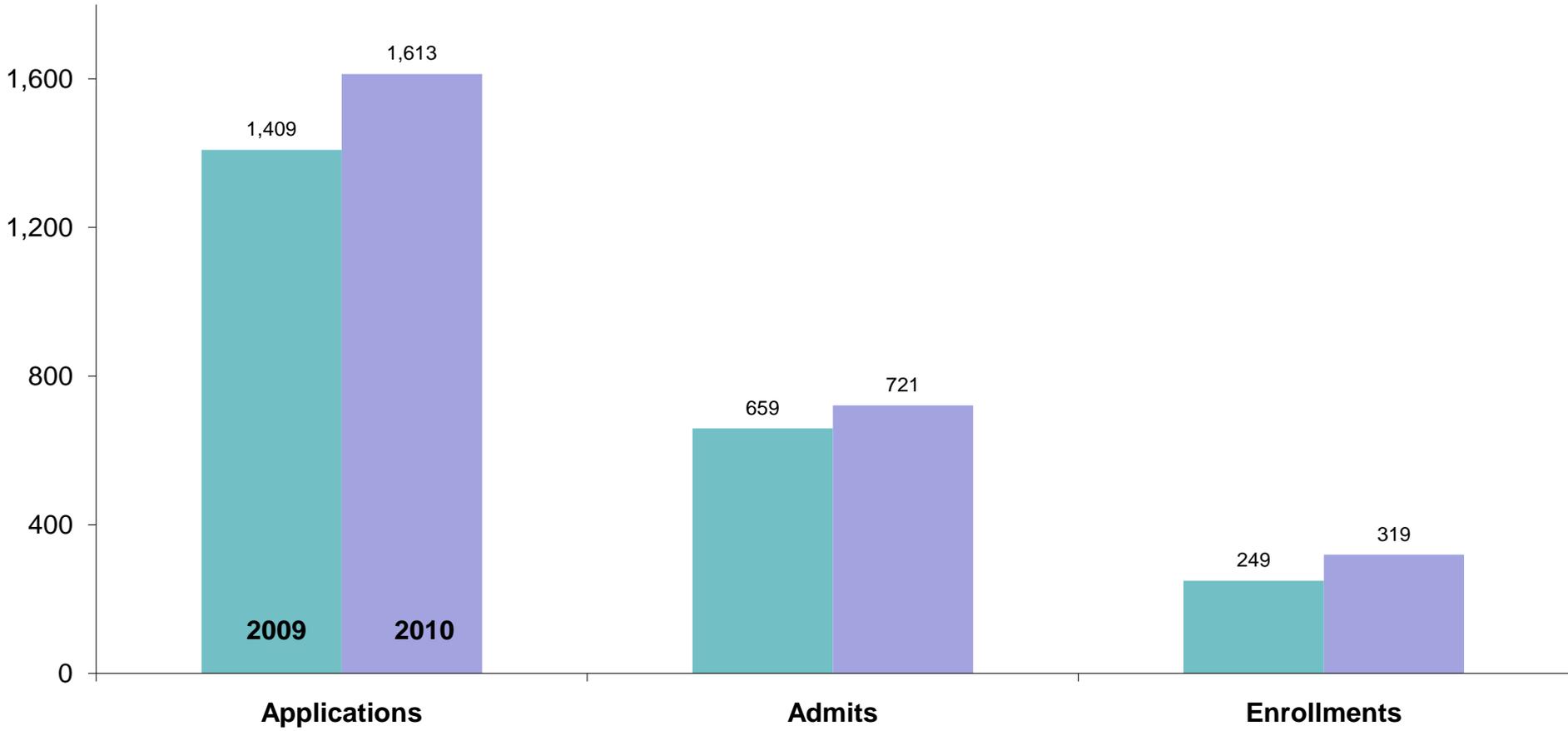
AFTER

Stacked area charts can add depth to a simple line chart and visually show trends over the entire term.

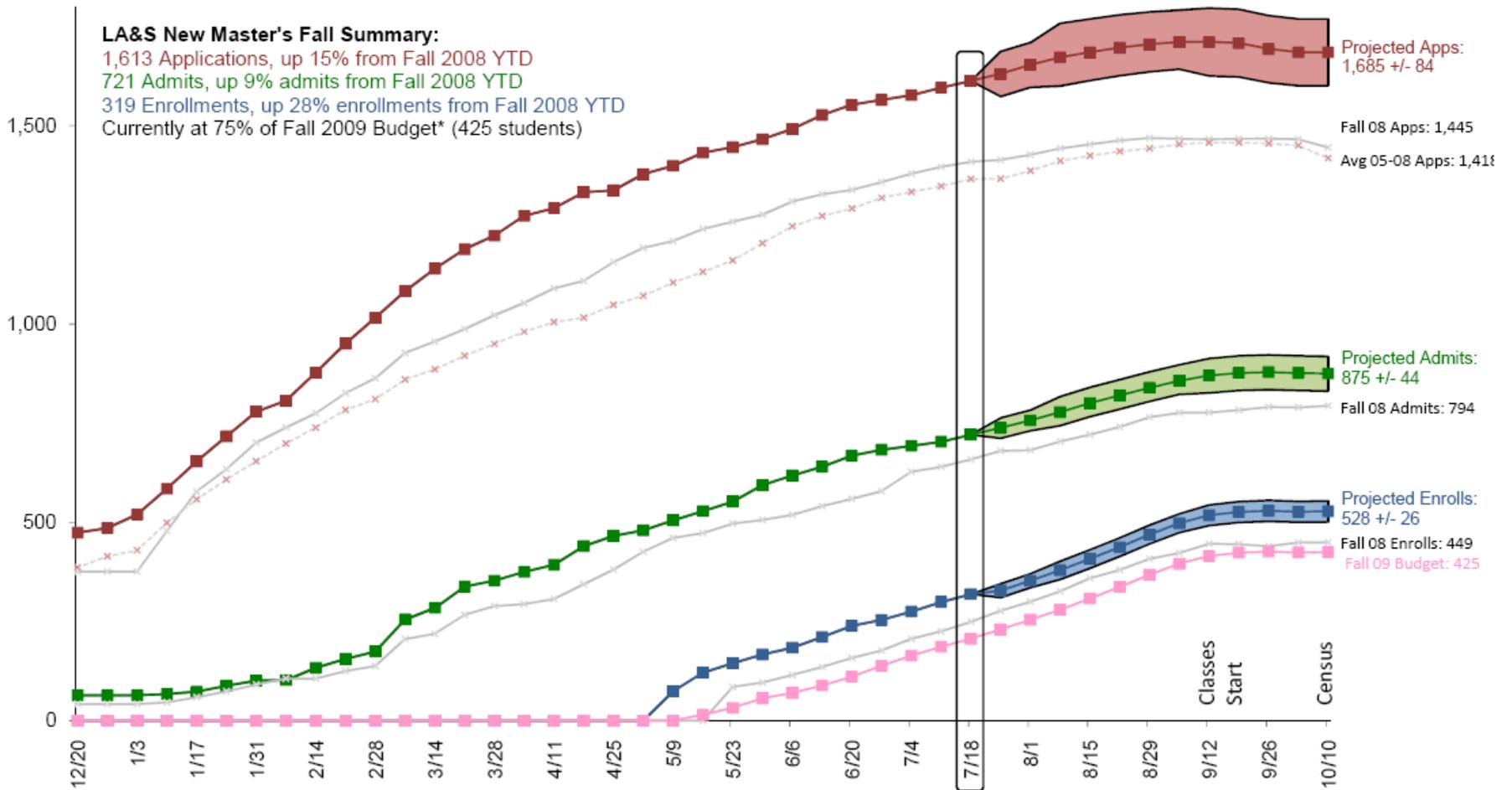Tables can be difficult to quickly analyze.

2009 to 2010 Change in Transfer Enrollment by College and Ethnicity							
	American Indian	Asian	Black	Hispanic	Multiracial	Not Applicable	White
Commerce	-1%	5%	2%	22%	23%	-16%	2%
Communication	6%	-1%	10%	16%	17%	-5%	5%
Computer Science	-1%	2%	7%	21%	19%	-19%	6%
Education	3%	13%	16%	33%	15%	11%	12%
Liberal Arts	-2%	5%	5%	16%	21%	-21%	11%
Music	-1%	2%	3%	15%	33%	-16%	6%
Theatre	-2%	1%	2%	21%	16%	-17%	3%

AFTER

Heat maps can be used to quickly highlight increases or decreases.

2009 to 2010 Change in Transfer Enrollment by College and Ethnicity						
	American Indian	Asian	Black	Hispanic	Multiracial	Not Applicable	White
Commerce	-1%	5%	2%	22%	23%	-16%	2%
Communication	6%	-1%	10%	16%	17%	-5%	5%
Computer Science	-1%	2%	7%	21%	19%	-19%	6%
Education	3%	13%	16%	33%	15%	11%	12%
Liberal Arts	-2%	5%	5%	16%	21%	-21%	11%
Music	-1%	2%	3%	15%	33%	-16%	6%
Theatre	-2%	1%	2%	21%	16%	-17%	3%

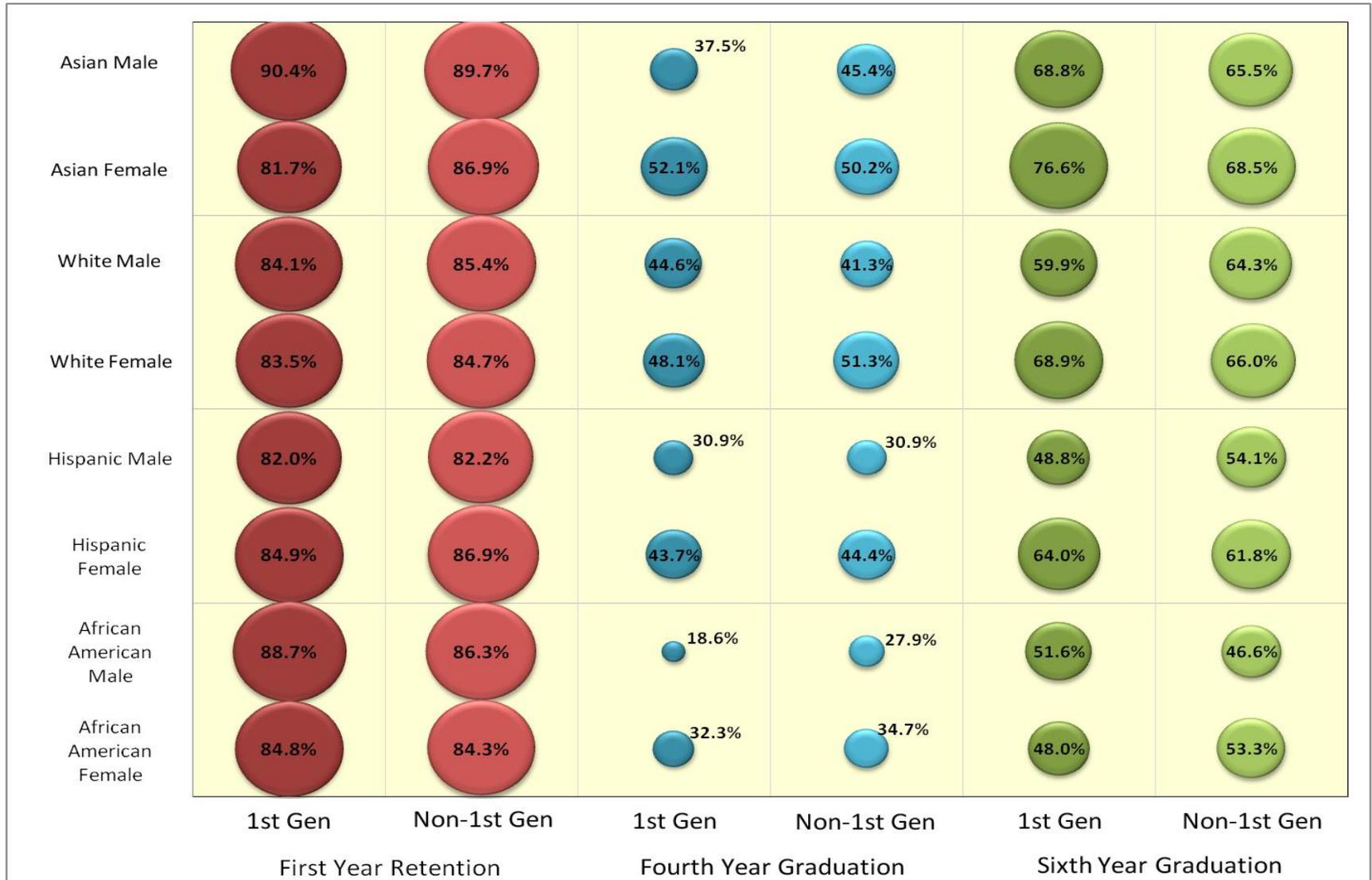# Even More Advanced Graphs

BEFORE

Comparing multidimensional factors that relate to one outcome can be tricky to express in one graphic.

1st, 4th, and 6th Year Retention/Graduation Rates by Gender, Race, and 1st Generation Status

DEPAUL UNIVERSITY
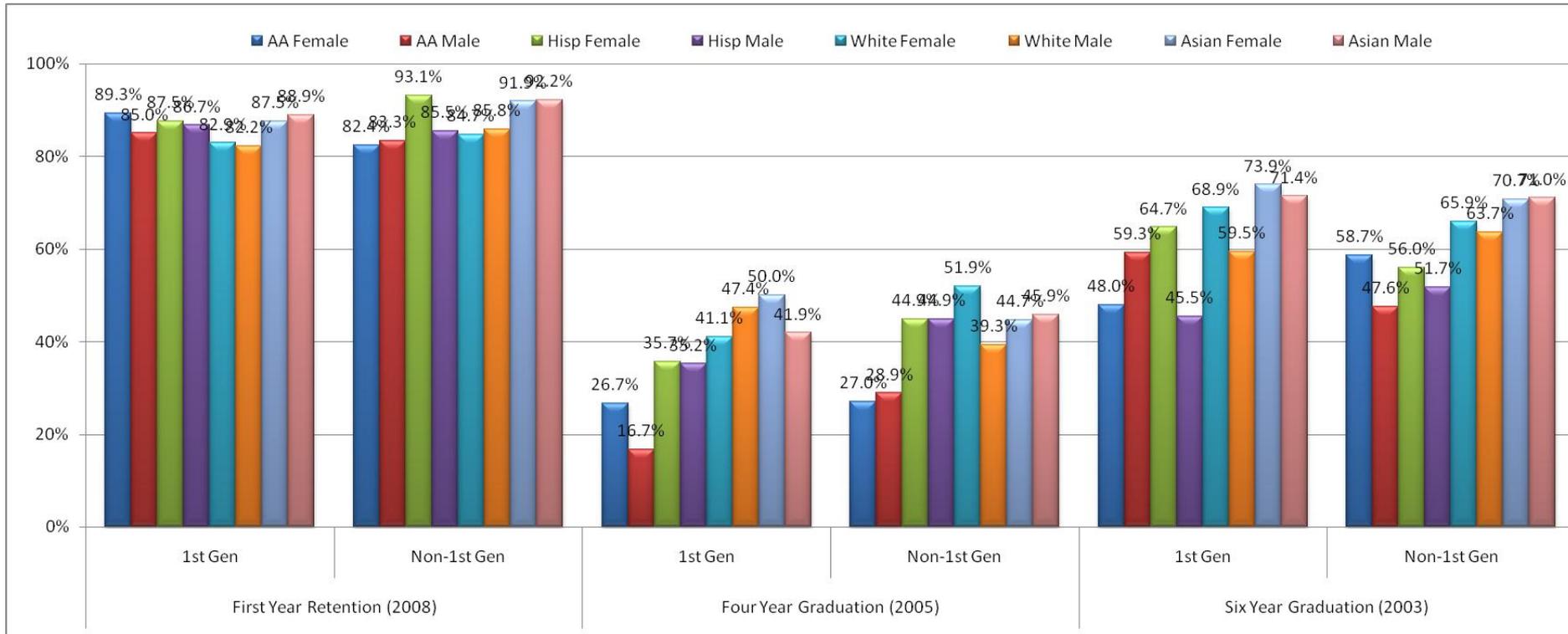
AFTER — Creating a multi-dimensional graphic using size, color, axes, and text can help highlight important differences

|	First Year Retention		Fourth Year Graduation		Sixth Year Graduation	
	1st Gen	Non-1st Gen	1st Gen	Non-1st Gen	1st Gen	Non-1st Gen
Asian Male	90.4%	89.7%	37.5%	45.4%	68.8%	65.5%
Asian Female	81.7%	86.9%	52.1%	50.2%	76.6%	68.5%
White Male	84.1%	85.4%	44.6%	41.3%	59.9%	64.3%
White Female	83.5%	84.7%	48.1%	51.3%	68.9%	66.0%
Hispanic Male	82.0%	82.2%	30.9%	30.9%	48.8%	54.1%
Hispanic Female	84.9%	86.9%	43.7%	44.4%	64.0%	61.8%
African American Male	88.7%	86.3%	18.6%	27.9%	51.6%	46.6%
African American Female	84.8%	84.3%	32.3%	34.7%	48.0%	53.3%

BEFORE

Many times we want to compare to several groups, as in the case of benchmarking

6th Year Graduation Rates by Gender and Institution
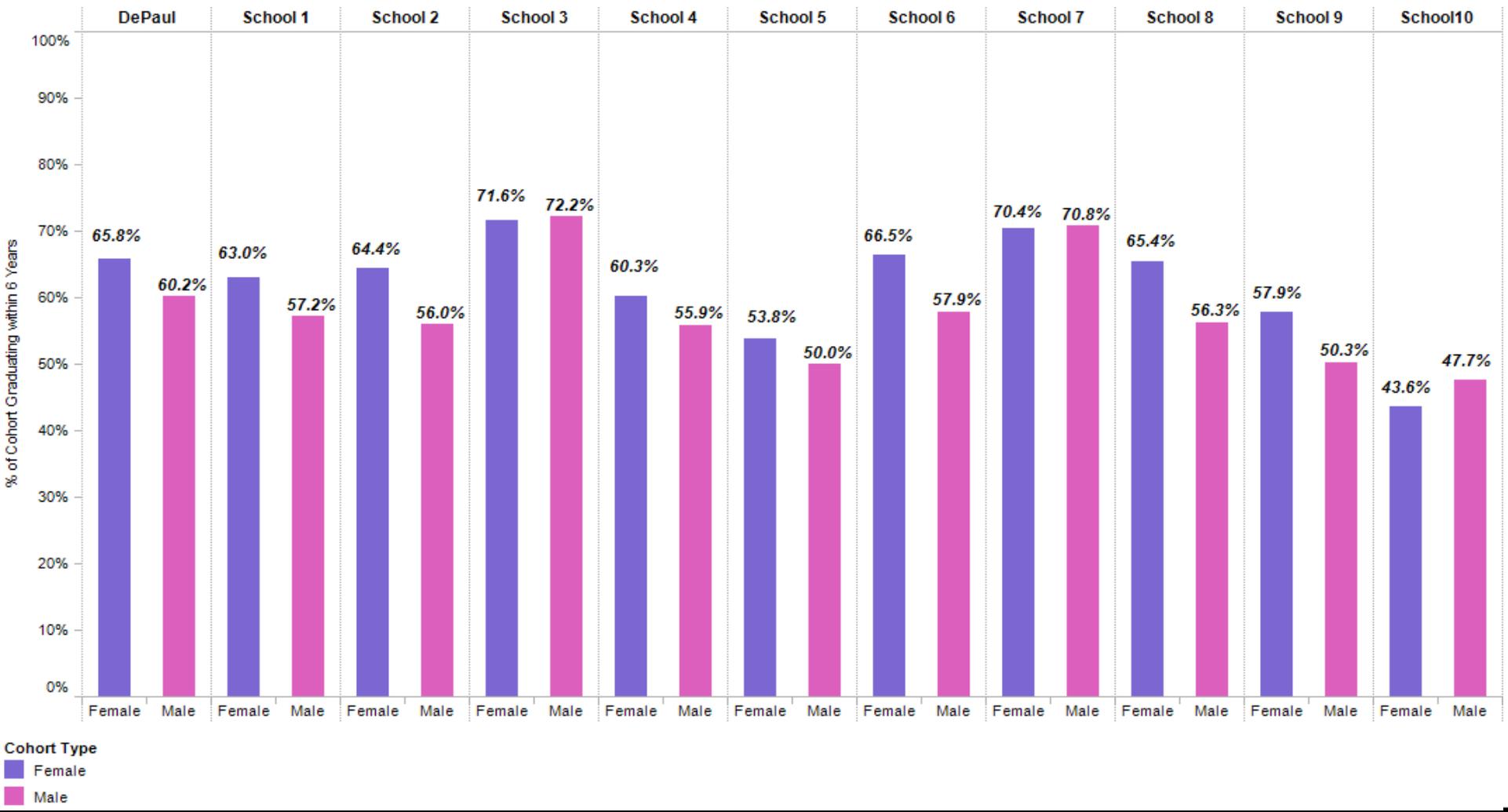
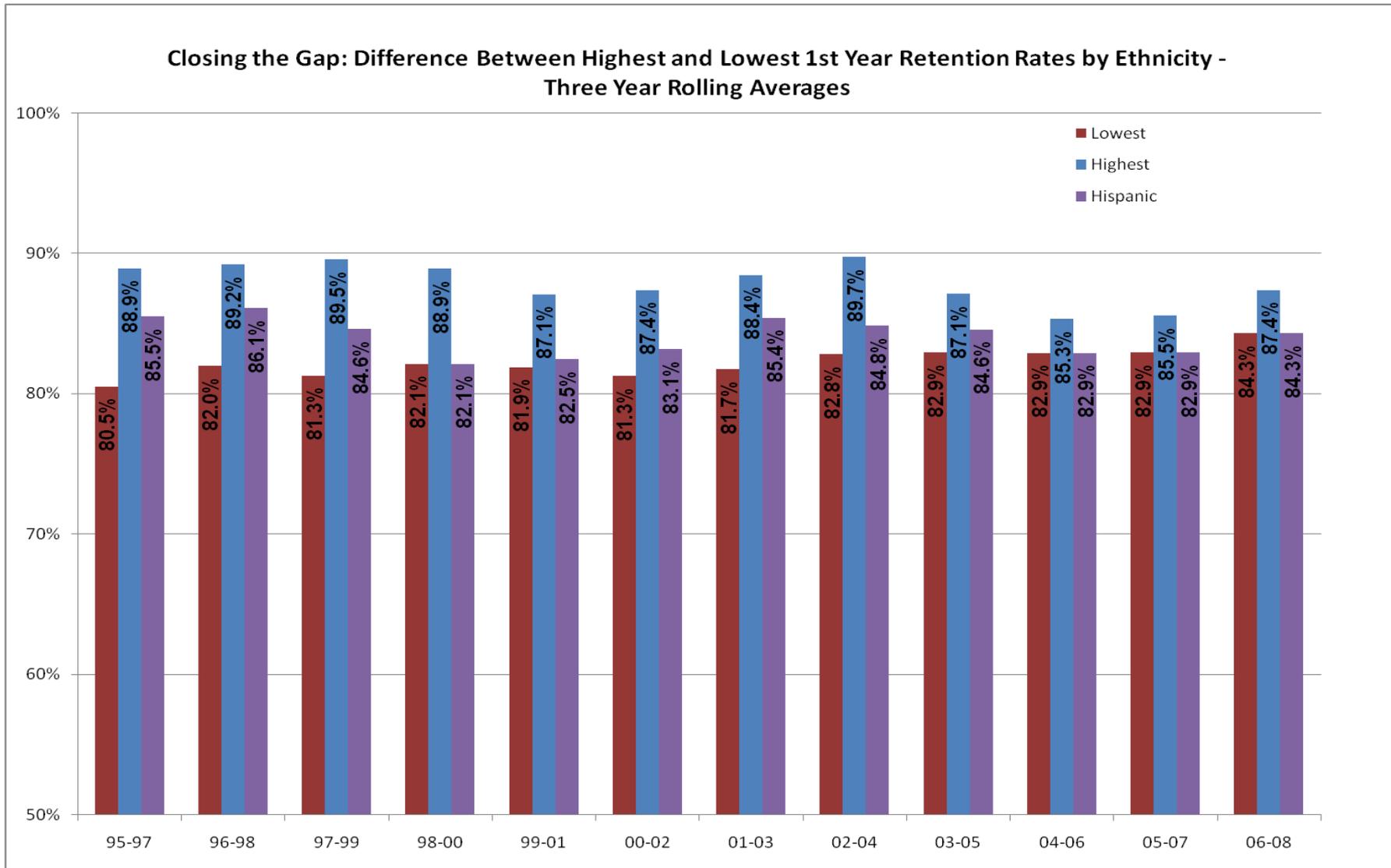**AFTER** Box and whiskers can provide a range of scores to help organize the multiple values and provide a more linear way of comparing data.
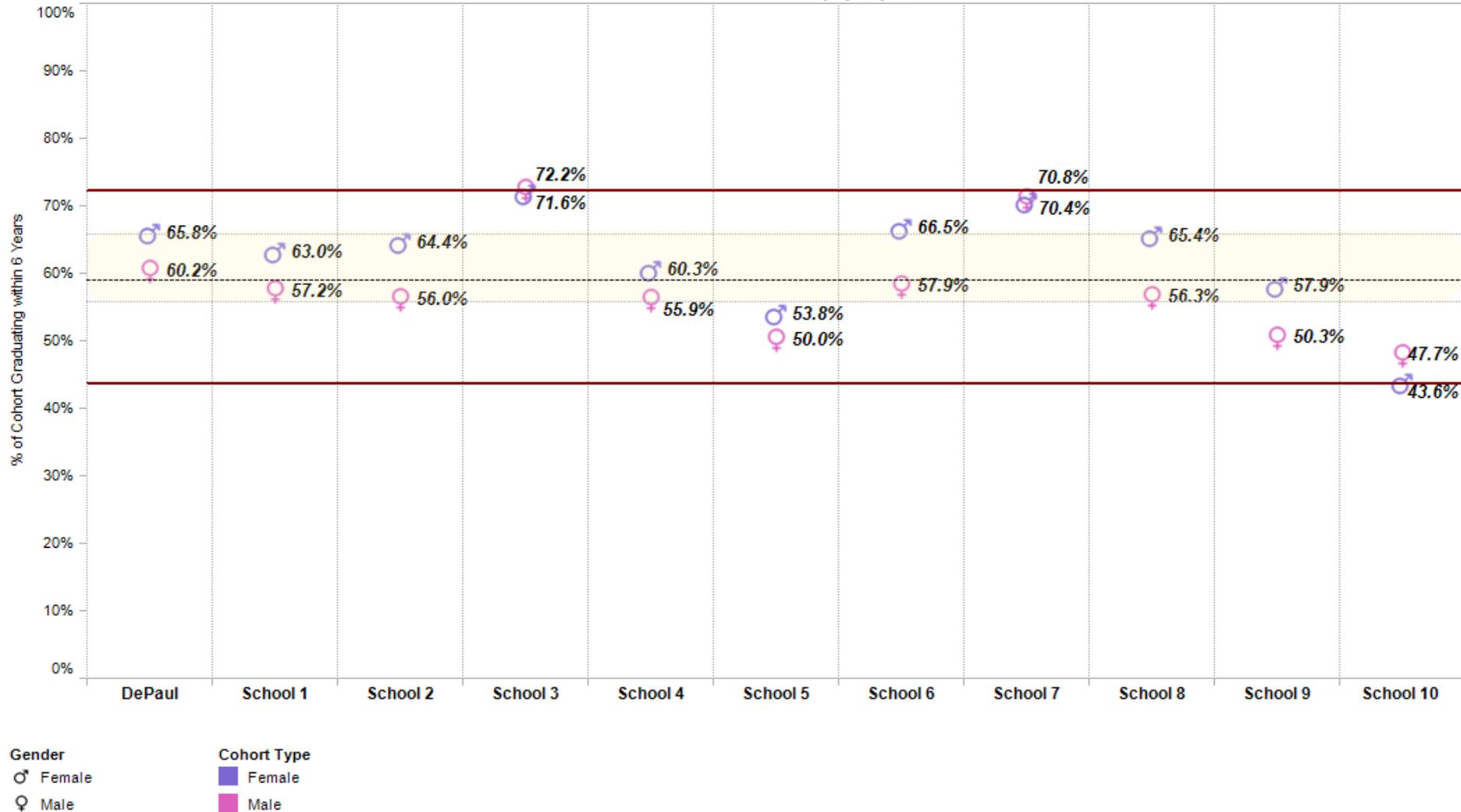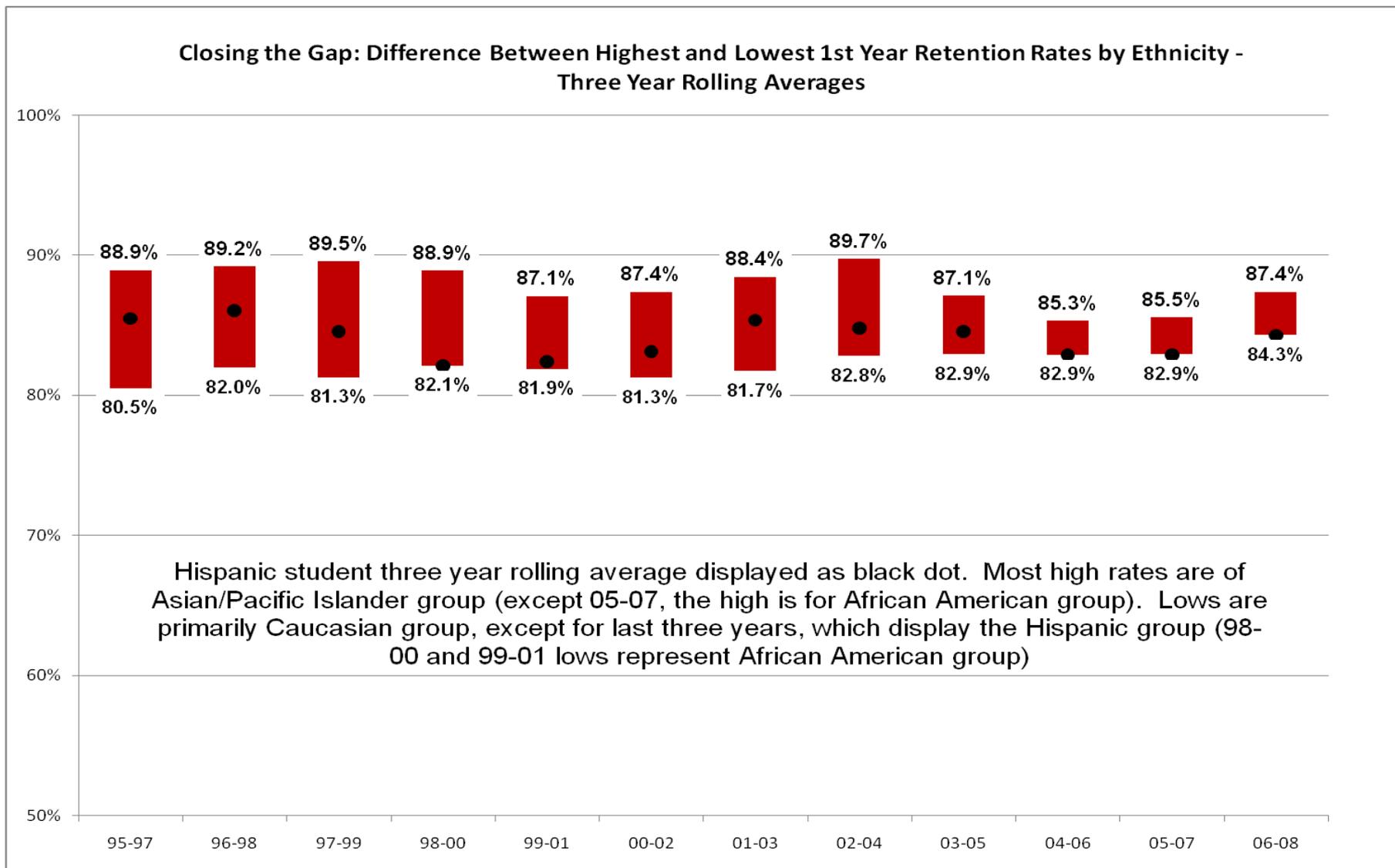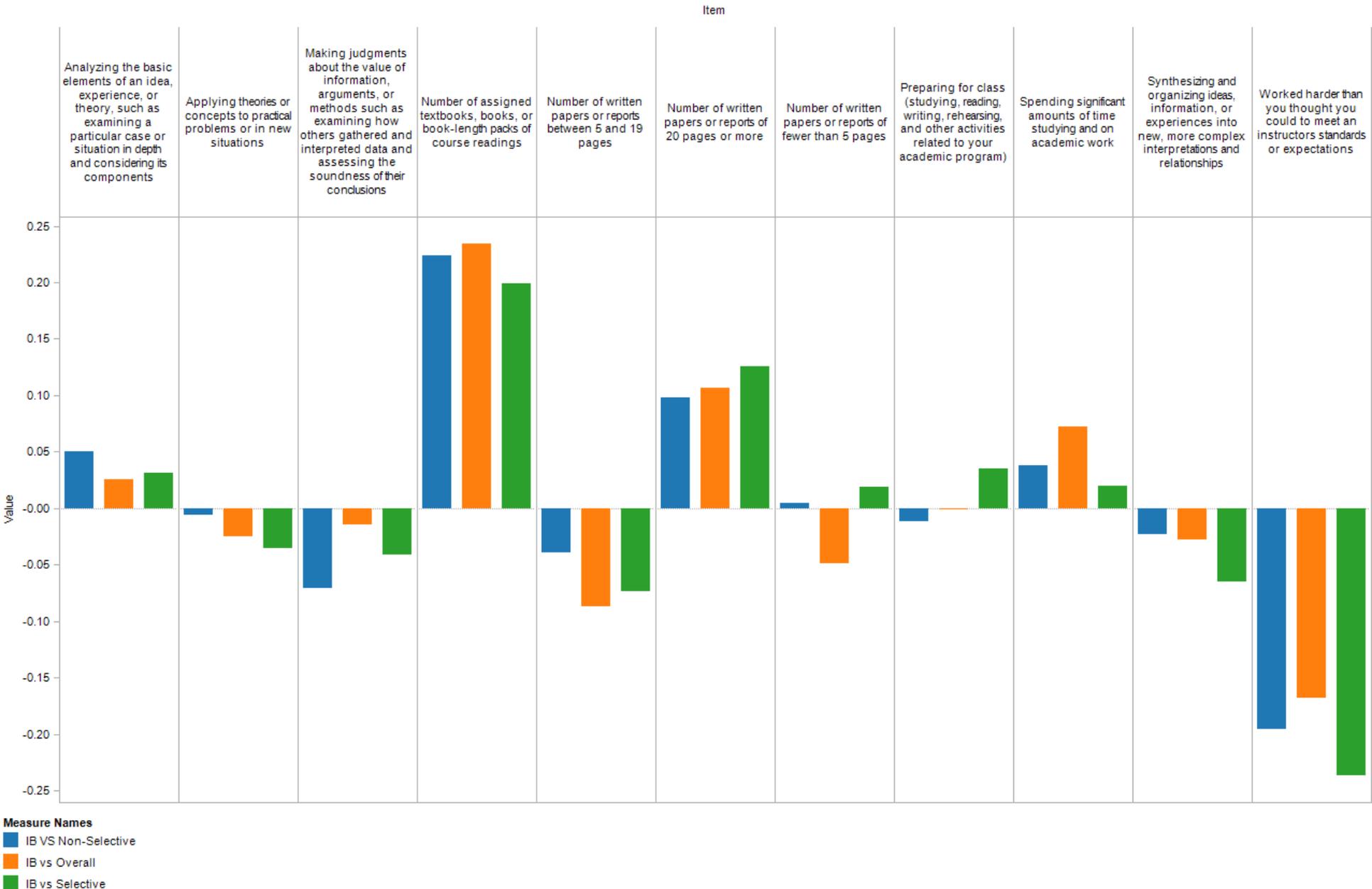
AFTER Displaying only what is of interest eliminates chart noise and helps the audience focus on relevant information.

Closing the Gap: Difference Between Highest and Lowest 1st Year Retention Rates by Ethnicity - Three Year Rolling Averages

Hispanic student three year rolling average displayed as black dot. Most high rates are of Asian/Pacific Islander group (except 05-07, the high is for African American group). Lows are primarily Caucasian group, except for last three years, which display the Hispanic group (98-00 and 99-01 lows represent African American group)

| Period	High	Low
95-97	88.9%	80.5%
96-98	89.2%	82.0%
97-99	89.5%	81.3%
98-00	88.9%	82.1%
99-01	87.1%	81.9%
00-02	87.4%	81.3%
01-03	88.4%	81.7%
02-04	89.7%	82.8%
03-05	87.1%	82.9%
04-06	85.3%	82.9%
05-07	85.5%	82.9%
06-08	87.4%	84.3%

AFTER

Advanced graphics can compare one group to two other groups using placement and color

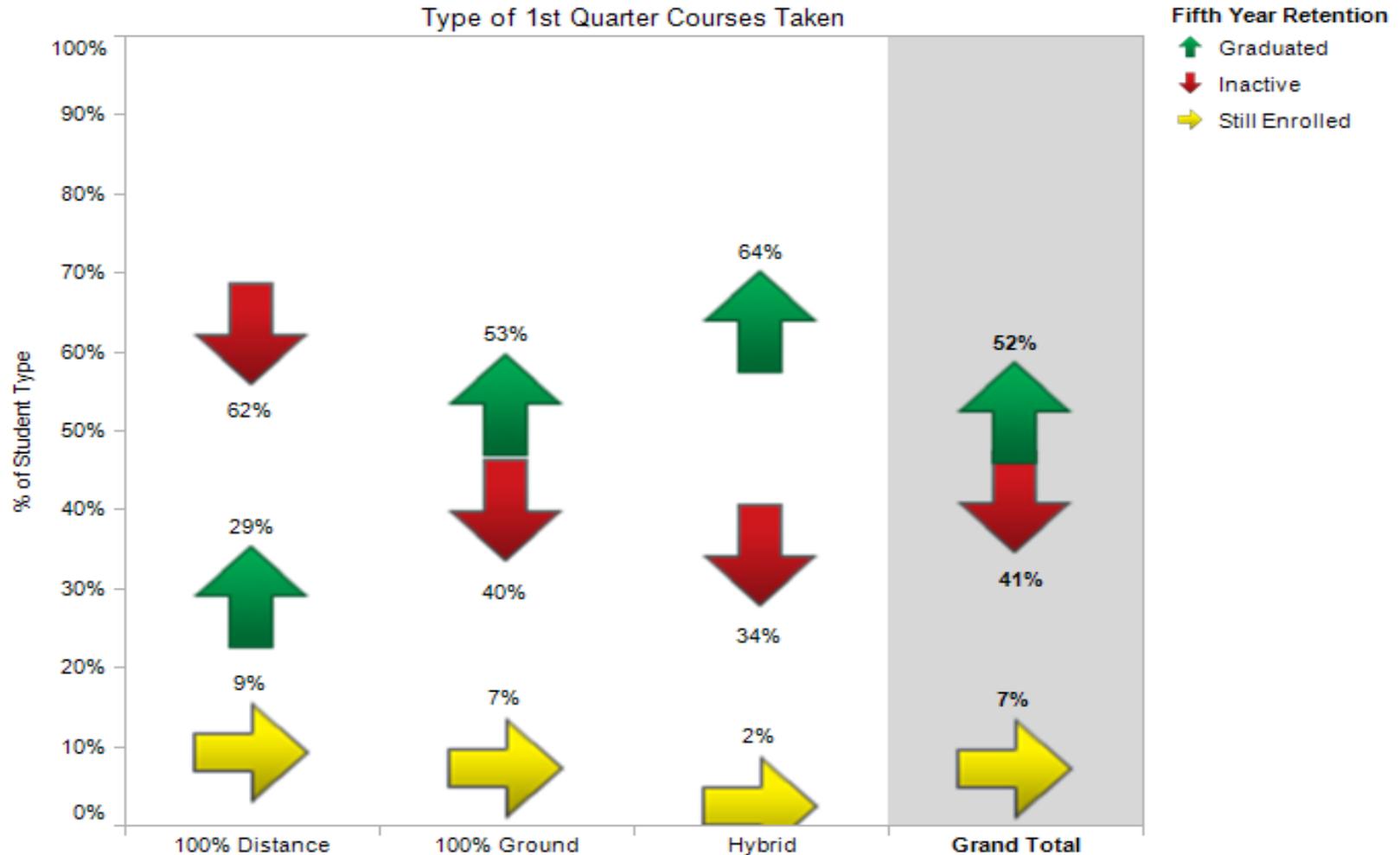Determining how a group is split amongst categories compared to other groups is also a common phenomenon

Fifth Year Retention by Student Type
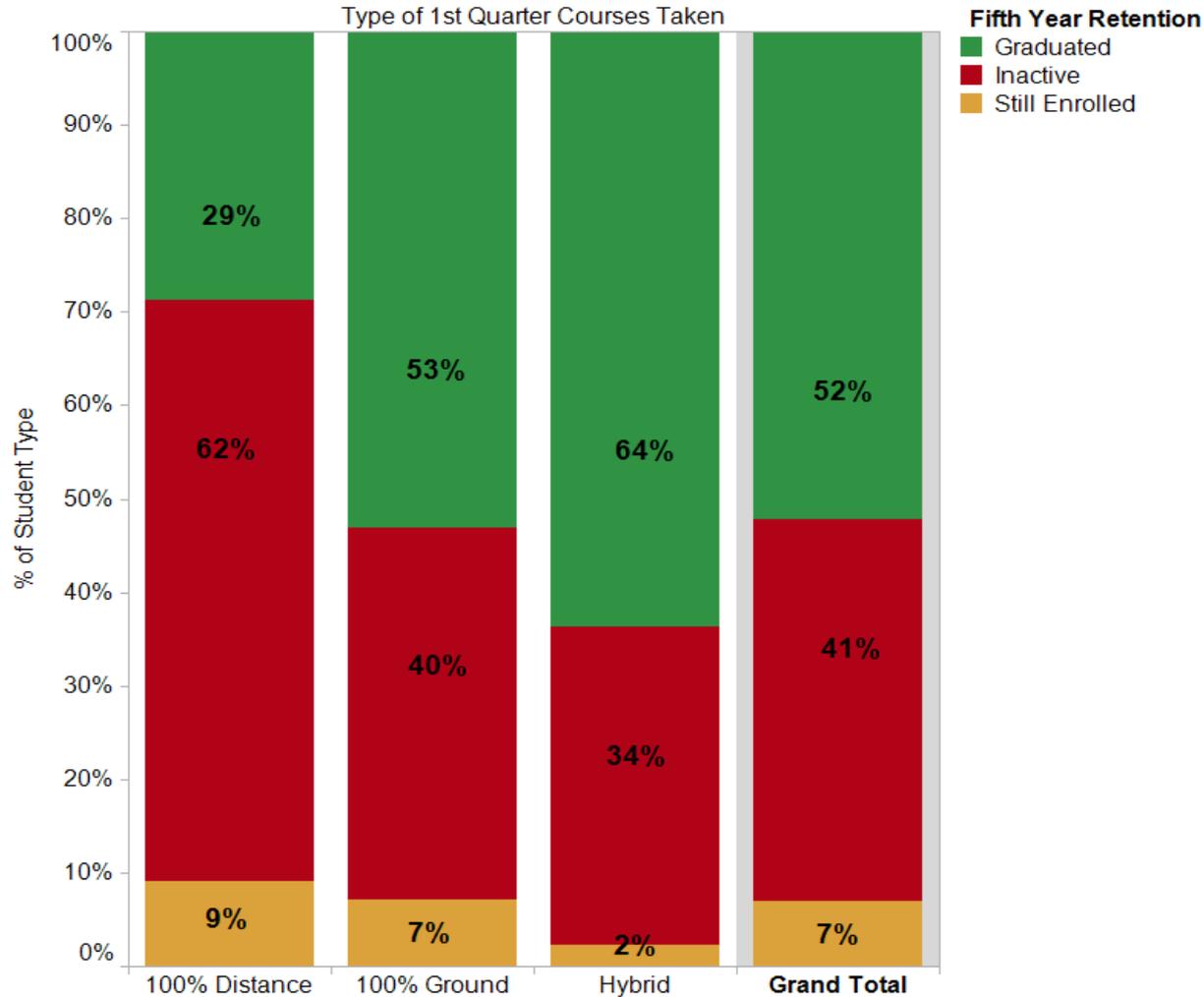
Get creative and think outside the bar by replacing the bars with more telling graphical depictions

Fifth Year Retention by Student Type

BEFORE

Any time location is a factor, capturing its essence can be difficult

Proportion of Non-Retained/Retained Students by Zip Code: 1999-2003

Retention Proportion
- Not Retained After One Year
- Retained After One Year

Transfer Population
- 75 to 100
- 50 to 74
- 25 to 49
- 1 to 24
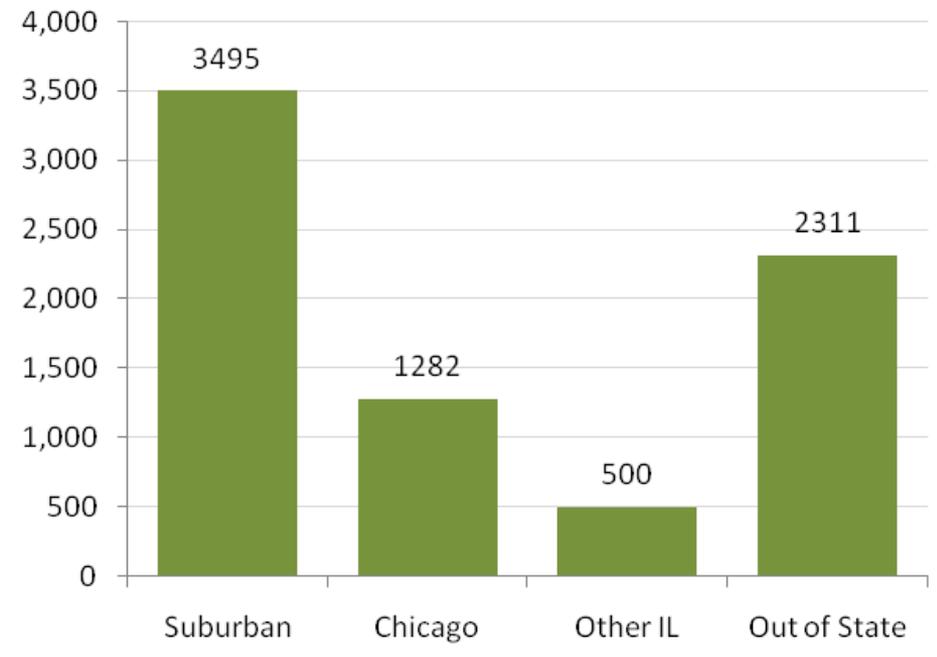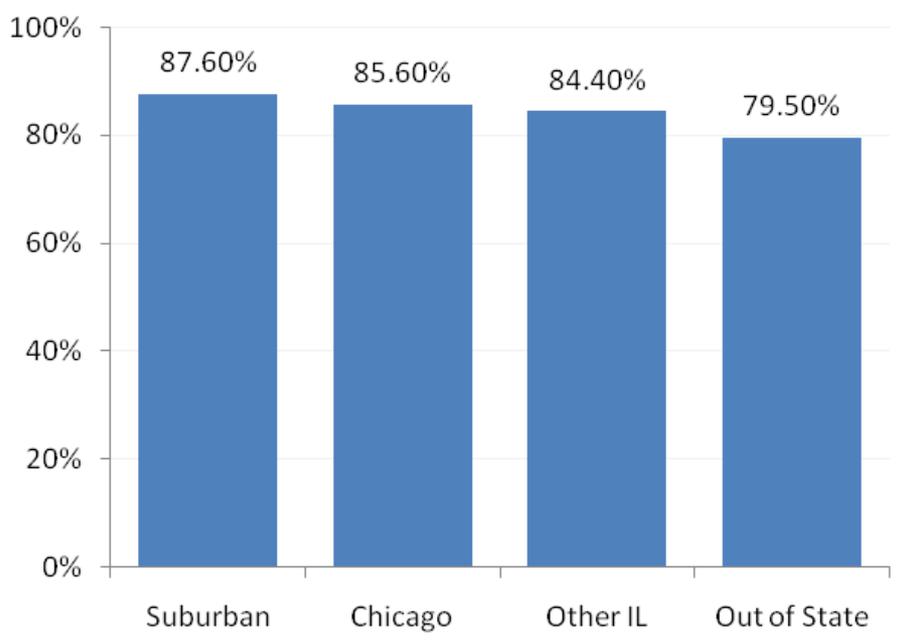
There is a place for everything.

Bar charts to display multiple descriptors in one screen

Profile of DePaul Transfer Students

All transfers (100%)

Category	Descriptor	Value
Admission	Growth in applications (07-09)	16%
	Growth in enrollment (07-09)	20%
	Admit Rate	62%
	Yield	56%
Gender	Female	55%
Ethnicity	White	
	Hispanic	13%
	Black	12%
	Asian	
Age	24 and older	43%
Transfer credit hours	< 44 (Freshman)	
	44-88 (Sophomore)	44%
	88+ (Junior)	36%
Incoming GPA	2.5+	77%
College	CLA&S	35%
	SNL	24%
	CCOMM	23%
	COMMU	
	SCTI	
	SEDUC	
	SMUSC	
	THESC	
1st-yr retention*	Retained	82%
1st-yr GPA (nonS..	2.5 and above	78%
4-yr graduation	Graduated	63%

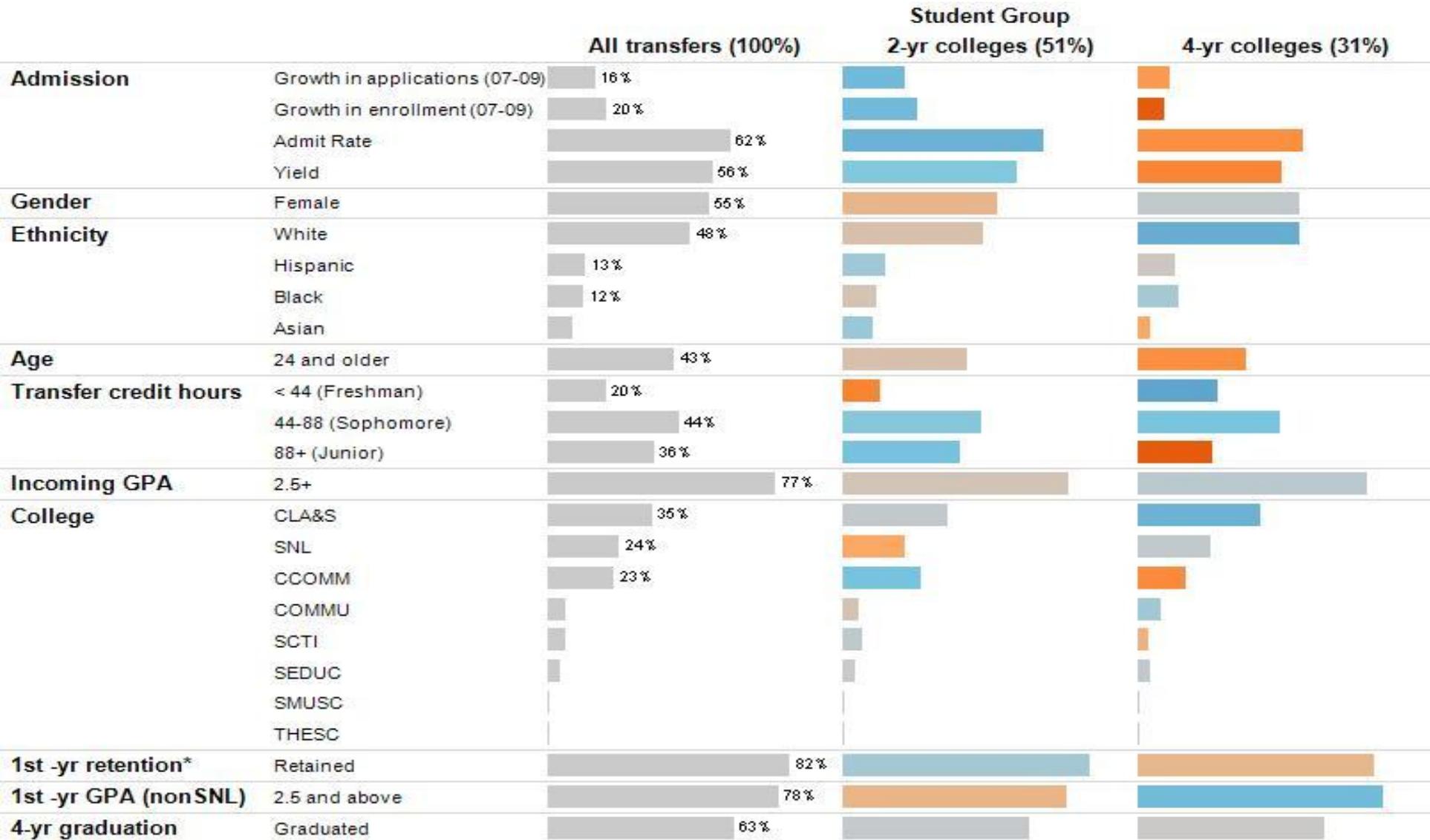**BEFORE** chart to display descriptors of several groups in one screen

Profile of DePaul Transfer Students: Overall, 2-year and 4-year colleges
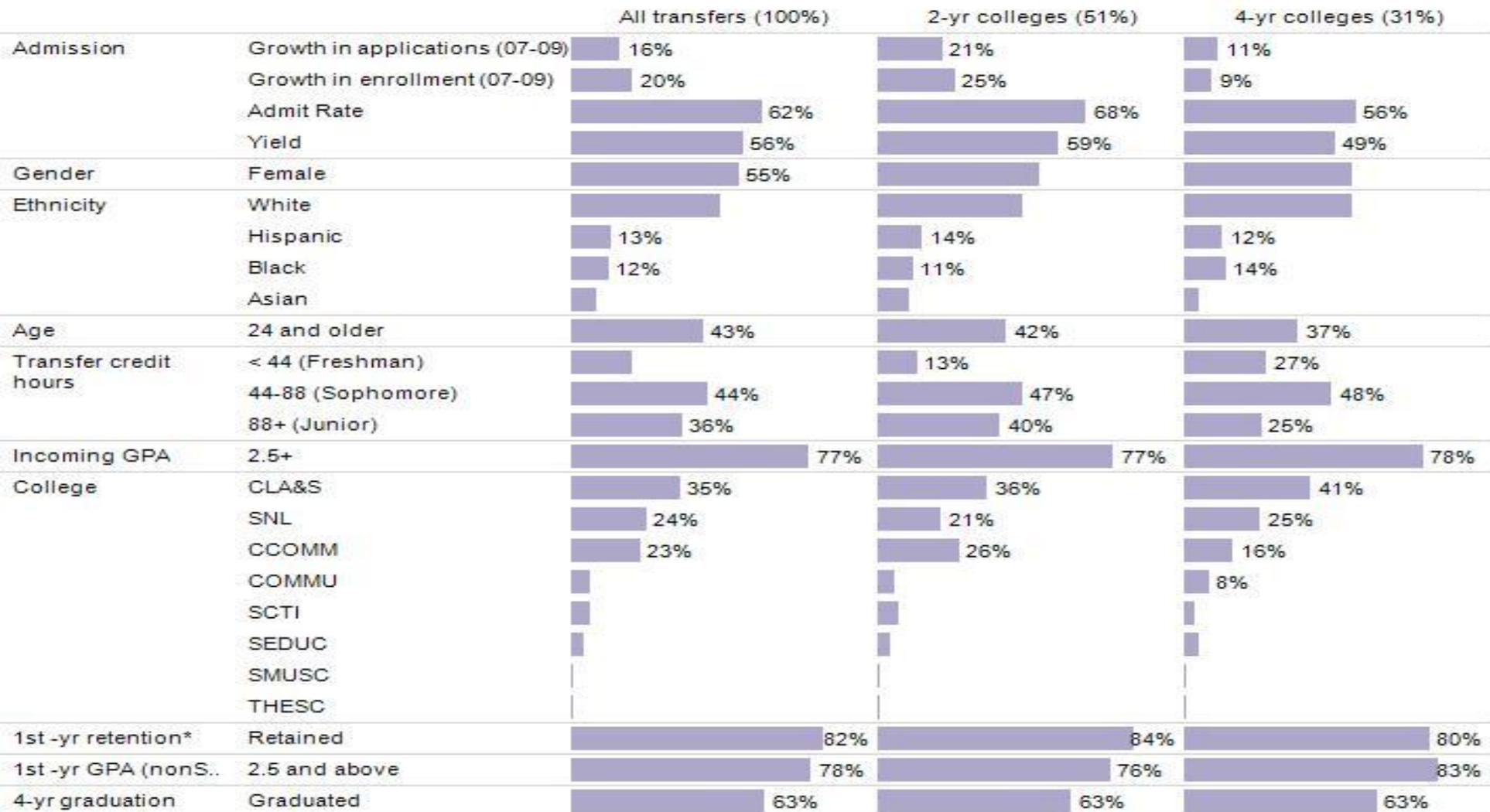
		All transfers (100%)	2-yr colleges (51%)	4-yr colleges (31%)
Admission	Growth in applications (07-09)	16%	21%	11%
	Growth in enrollment (07-09)	20%	25%	9%
	Admit Rate	62%	68%	56%
	Yield	56%	59%	49%
Gender	Female	55%		
Ethnicity	White			
	Hispanic	13%	14%	12%
	Black	12%	11%	14%
	Asian			
Age	24 and older	43%	42%	37%
Transfer credit hours	< 44 (Freshman)		13%	27%
	44-88 (Sophomore)	44%	47%	48%
	88+ (Junior)	36%	40%	25%
Incoming GPA	2.5+	77%	77%	78%
College	CLA&S	35%	36%	41%
	SNL	24%	21%	25%
	CCOMM	23%	26%	16%
	COMMU			8%
	SCTI			
	SEDUC			
	SMUSC			
	THESC			
1st -yr retention*	Retained	82%	84%	80%
1st -yr GPA (nonS..	2.5 and above	78%	76%	83%
4-yr graduation	Graduated	63%	63%	63%

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Bar graphs: Use Color and Size to add 2 more dimensions.

Use color sensibly.
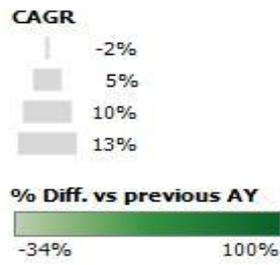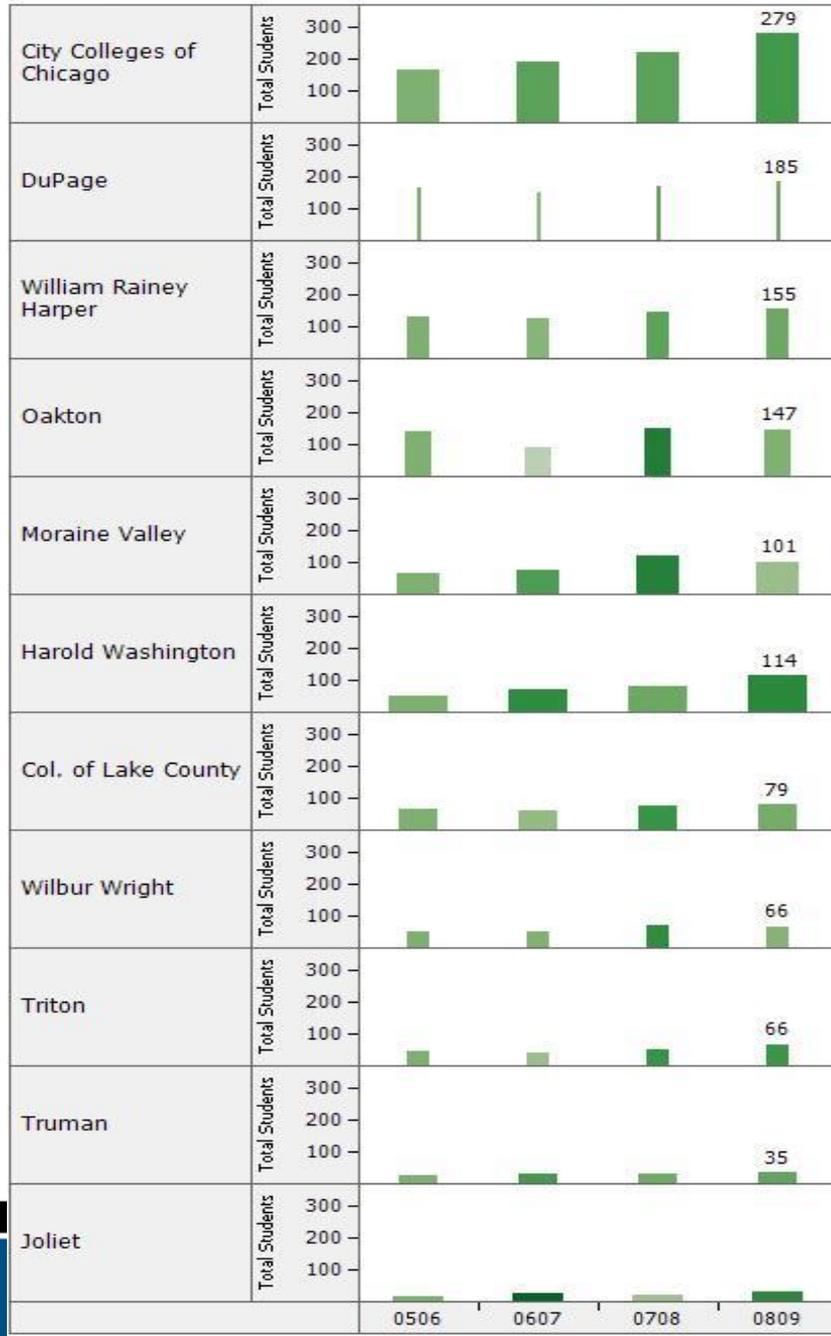
Super graphic

…are usually somewhat complex, interesting, involved images intended

present a ton of info clearly.
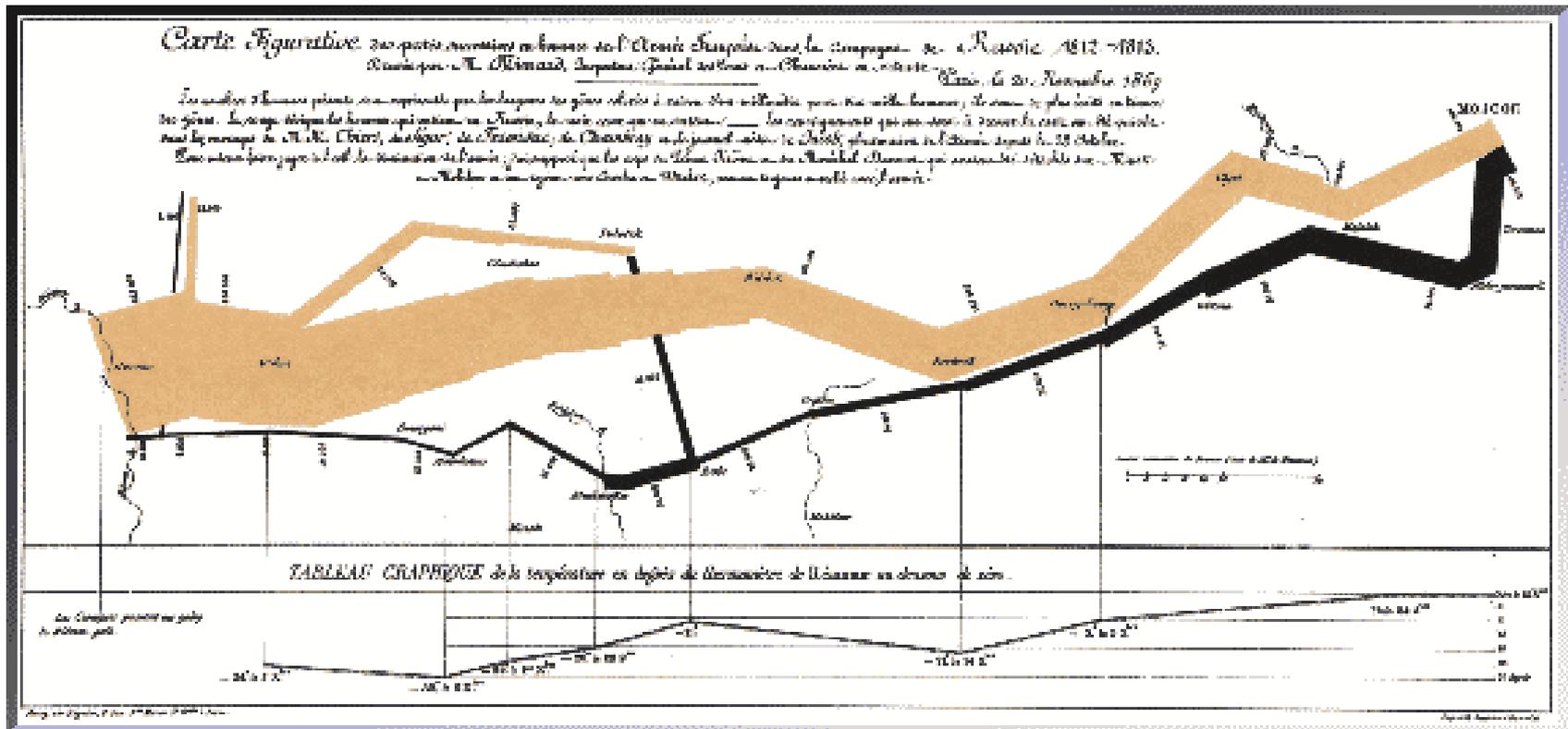
ACT Test Takers Graduating Class of 2009: Illinois Public and Catholic High Schools

Total Students (Total Schools)

School Type	2005	2009
Public (684)	121,262	129,092
Catholic (73)	9,979	9,787
Other Private (121)	2,526	2,880

Trend 2005-2009

Public: 121,262 → 129,092
Catholic: 9,979 → 9,787
Other Private: 2,526 → 2,880
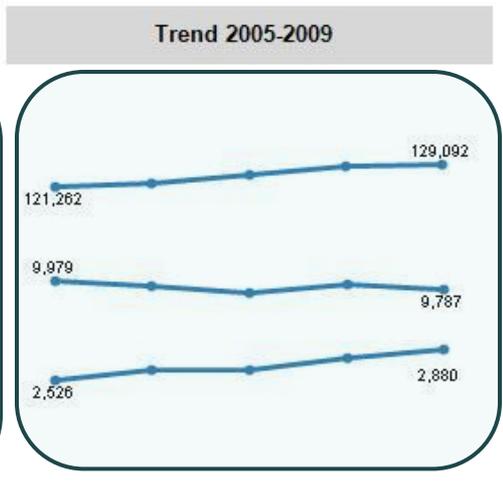
ACT Scores (2008)

Average ACT		Public	Catholic
	Composite	20.5	22.8
	English	20.1	23.4
	Math	20.6	22.1
	Reading	20.4	23.2
	Science	20.3	22.1

Seniors from Catholic HS (under Dioceses) account for 7.5% of total seniors graduating in 2009. While the number of HS graduates public schools increased 8% in the last 5 years, the number of the Catholic HS declined by 2%.
Compared to students from the IL public schools, students from the Catholic schools had a higher % of students who are White and/or from higher income. They also had a higher average ACT score and were more likely to plan to attend 4-year private college.
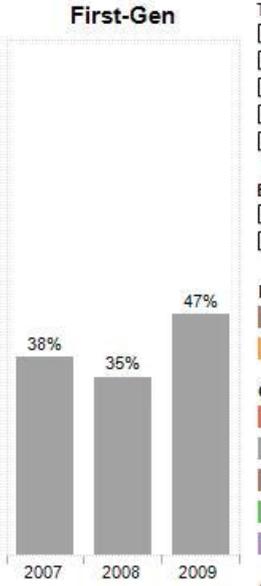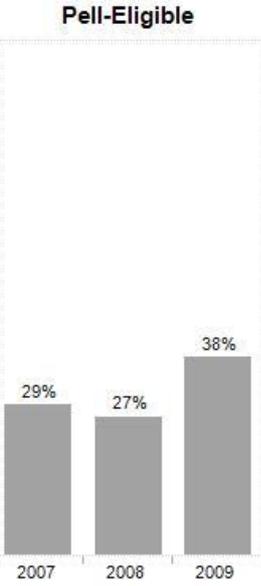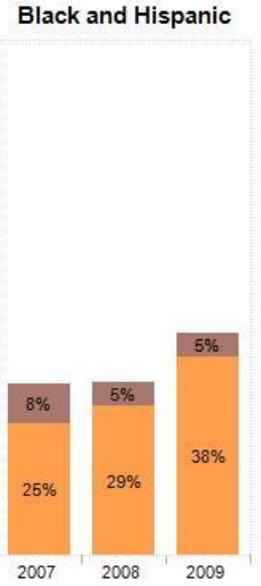
Student Profile

		Public	Catholic
Gender	Female		47%
Ethnicity	African American	15%	8%
	Asian American		2%
	Caucasian	57%	65%
	Mexican, P.Rican/Cuban/Hisp		11%
Religion	Catholic	17%	60%
Income Level	Less than $50K	38%	20%
	$50K - $80K		16%
	$80K - $100K	7%	12%
	More than $100K	9%	19%
Intended College Location	In Illinois		58%
Intended College Type	4-yr private	11%	29%
College Choice (1 of 6 choices)	DePaul	5%	8%
Financial Aid	Need Fin. Aid		69%
Top 10 Intended Major	Undecided	10%	20%
	Health Sciences		14%
	Business & Mgmt/Office		11%
	Social Sciences		6%
	Education/Teacher Ed		5%
	Engineering/Eng Tech		5%
	Math & Science		5%
	Visual & Performing Arts/Classi..		4%
	Communications		3%
	Community & Pers Serv		2%

% Difference compared to Public
-100%   100%
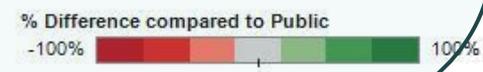
Archdiocese of Chicago: Map, Size and Avg. ACT Scores (ACT Test Takers Graduating Class of 2008)

MOTHER MCAULEY: 357 seniors graduating in '08 took the ACT test, their average ACT score was 22. Of the test takers, 15% sent their scores to DePaul.

* ST BENEDICT, a big shoulder school (*): 48 seniors graduating in '08 took the ACT test, their average ACT score was 19. Of the test takers, 42% sent their scores to DePaul.

Avg. ACT Composite Score
15 ─ 27

% Scores Rcvd. by DePaul
≤ 10%
20%
30%
≥ 40%

* Big Shoulder

Data Source: EIS 2008.
Graphic by EMR/Rina..

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Interactive

DePaul Freshmen from the Archdiocese of Chicago High Schools
Enrollment, Demographic and Academic Profile

Freshman Enrollment

	2007	2008	2009
LOYOLA	22	19	22
MARIST	10	24	14
MARIAN	17	13	10
MOTHER MCAULEY	20	11	9
CARMEL	13	17	8
ST VIATOR	15	7	13
ST PATRICK	11	8	14
DE LA SALLE	9	14	9
FENWICK	15	7	9
ST IGNATIUS CP	8	13	9
NAZARETH	11	10	7
GUERIN PREP	7	6	12
RESURRECTION	9	5	9
CRISTO REY JESUIT	6	5	7
NOTRE DAME	7	6	5
GORDON TECHNICAL	5	6	6
ST JOSEPH	6	1	9
TRINITY	9	2	5
BROTHER RICE	6	3	6
REGINA DOMINICAN	7	2	4
ST BENEDICT	4	3	3
NOTRE DAME GIRLS	3	3	3
ST SCHOLASTICA	5	3	1
QUEEN OF PEACE	1	4	3
ST LAURENCE	1	2	5
MT CARMEL	2	3	2
ST RITA OF CASCIA	2	4	1
HOLY TRINITY	1	1	4
MARIA	3	2	
MT ASSISI	2	1	1
WOODLANDS	1	1	1
SETON	1	1	
ST FRANCIS DESALES			2
LEO		1	
ST MARTIN DE PORRES			1
Grand Total	**239**	**208**	**214**

Female
2007: 59%, 2008: 52%, 2009: 57%

Black and Hispanic
2007: 8% / 25%, 2008: 5% / 29%, 2009: 5% / 38%

Pell-Eligible
2007: 29%, 2008: 27%, 2009: 38%

First-Gen
2007: 38%, 2008: 35%, 2009: 47%

Average ACT
2007: 23.5, 2008: 24.1, 2009: 23.1

College
2007: 7% / 5% / 5% / 31% / 52%
2008: 6% / 8% / 10% / 26% / 49%
2009: 5% / 9% / 10% / 25% / 50%

1st-Yr Ret.
2007: 92%, 2008: 93%

Acad. Perf.
2007: 22% / 57%, 2008: 19% / 63%

Legend
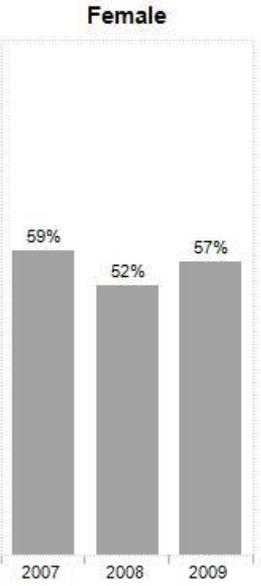
Term
- ☐ 2005
- ☐ 2006
- ☑ 2007
- ☑ 2008
- ☑ 2009

Big Shoulder
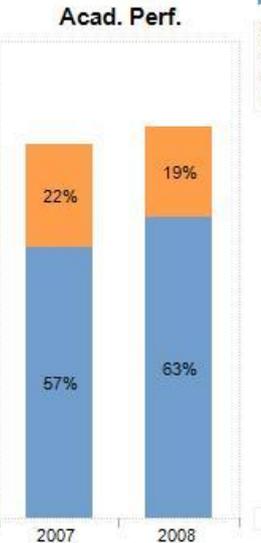- ☑ No
- ☑ Yes

Ethnicity
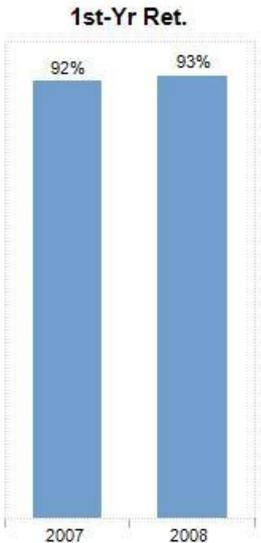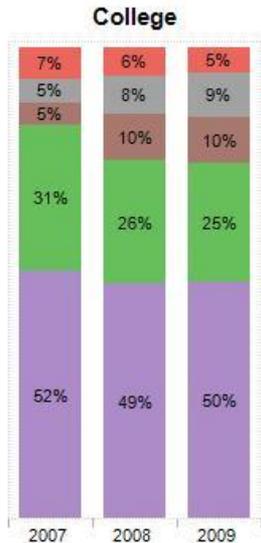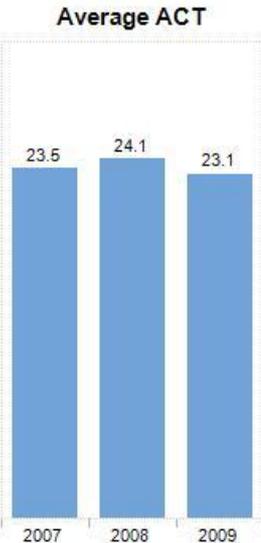- Black
- Hispanic

College
- SEDUC
- COMMU
- CDM
- CCOMM
- CLA&S

Acad. performance (1st Year)
- Mod
- High

Mod: GPA < 2.5 or Earned = 37-47 crd hrs
High: GPA >=2.5 & Earned > 48 crd hrs

EMR, Jan 2010

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What We've Learned

- Add dimension or create a multi-dimension graphic displays
- Synthesize your information
- Apply good graphic design principles
- Bar charts can still be useful

Goals: Provide quicker access to meaningful insights

Contact Info

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