Academic Performance and Persistence: The Role of Math Gateway Courses

Office of Institutional Research
April 2007

Please contact Shannon Tinney, OIR Research Analyst with questions at 410-455-2111
Objectives

• Specify a baseline model of persistence for FT/FT freshmen over time

• Assess the relationship between academic performance and persistence
Objectives

• Examine the role of 1st semester performance in Math gateway courses on semester retention.

• Assess if enrolling in the advised Mathematics course is related to 1st semester academic success and retention.
Methodology

• **Dependent Variables**
  – Retention
    • Semester
    • 1-year
    • 2-year
  – Graduation
    • 6-year
Methodology

- **Population**
  - For retention models:
    - 2000 to 2004 cohorts of FT/FT freshmen (n=6,883)
    - Deceased and duplicate cases excluded (n=5)
  - For 6-year graduation model:
    - 1995 to 1999 cohorts of FT/FT freshmen (n=5,748)
    - Deceased and duplicate cases excluded (n=7)
Methodology

• Independent Variables of Interest:
  – 1st semester academic performance
  – Academic Performance in 1st semester Math gateway course
    • Math 106: Algebra & Elementary Functions
    • Math 150: Pre-Calc
    • Math 151: Calc for STEM majors
Methodology

• Control Variables
  – Term
  – Sex
  – Race
  – Geographic origin
  – HS G.P.A.
  – SAT scores
  – AP credit
  – Math placement
  – Major area @ matriculation
  – Dorm status
  – Affiliated
  – UMBC scholarship
  – Applied for financial aid
  – Estimate family contribution
  – Cancel/withdrew 1st semester
Retention & Graduation Rates by Gender

- Semester: 91.1 Female, 82.4 Male
- One-year: 70.8 Female, 54.0 Male
- Two-year: 70.8 Female, 54.0 Male

Legend:
- Female
- Male
Retention & Graduation Rates by Race

- Semester: 91.1
- One-year: 82.4
- Two-year: 70.8
- Six-year: 54.0

- African-American: [Bars]
- White: [Bars]
- Hispanic: [Bars]
- American Indian: [Bars]
- International: [Bars]
- Asian: [Bars]
Retention & Graduation Rates
by Geographic Area

- Semester: 91.1
- One-year: 82.4
- Two-year: 70.8
- Six-year: 54.0

MD (excl. BW Metro area)
Baltimore Metro Area
Out of State
Washington Metro Area
Retention & Graduation Rates by Dorm Status

- Semester: Dorm Resident 91.1, Commuter 82.4
- One-year: Dorm Resident 82.4, Commuter 70.8
- Two-year: Dorm Resident 70.8, Commuter 54.0

Legends:
- Dorm Resident
- Commuter
Retention & Graduation Rates by Applied for Financial Aid

- Semester: 91.1
- One-year: 82.4
- Two-year: 70.8
- Six-year: 54.0

- Black: Applied
- Red: Did not Apply
Retention & Graduation Rates by Estimated Family Contribution

- **Semester**: 91.1%
- **One-year**: 82.4%
- **Two-year**: 70.8%
- **Six-year**: 54.0%

Legend:
- **Black**: > $20k
- **Yellow**: $15,001 - 20k
- **White**: $10,001 - 15k
- **Gray**: $5,001 - 10k
- **Teal**: $2,501 - 5k
- **Blue**: $1 - 2.5k
- **Red**: None
Retention & Graduation Rates by Affiliated at Matriculation

<table>
<thead>
<tr>
<th></th>
<th>Affiliated</th>
<th>Not Affiliated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester</td>
<td>91.1</td>
<td>82.4</td>
</tr>
<tr>
<td>One-year</td>
<td>82.4</td>
<td>70.8</td>
</tr>
<tr>
<td>Two-year</td>
<td>70.8</td>
<td>54.0</td>
</tr>
</tbody>
</table>

- Affiliated
- Not Affiliated
Retention & Graduation Rates by UMBC Scholarship

- Semester: UMBC Scholarship - 91.1, No UMBC Scholarship - 82.4
- One-year: UMBC Scholarship - 82.4, No UMBC Scholarship - 70.8
- Two-year: UMBC Scholarship - 70.8, No UMBC Scholarship - 54.0

Legend:
- UMBC Scholarship
- No UMBC Scholarship
Retention & Graduation Rates by Transferred in AP Credit

- Semester: 91.1%
- One-year: 82.4%
- Two-year: 70.8%
- Six-year: 54.0%

- AP credit
- No AP credit
Retention & Graduation Rates
by High School GPA

- Semester: 91.1
- One-year: 82.4
- Two-year: 70.8
- Six-year: 54.0

Legend:
- >=4.00
- 3.70 - 3.99
- 3.50 - 3.69
- 3.30 - 3.49
- 3.00 - 3.29
- <=2.99
Retention & Graduation Rates
by SAT (combined)

- **Semester:** 91.1
- **One-year:** 82.4
- **Two-year:** 70.8
- **Six-year:** 54.0

- **Scores Distribution:**
  - >=1500
  - 1400 - 1499
  - 1300 - 1399
  - 1200 - 1299
  - 1100 - 1199
  - < 1100
# Six-year Graduation: High School GPA by SAT Scores

(2000 – 2004 cohorts of FT/FT Freshmen)

<table>
<thead>
<tr>
<th>SAT Scores</th>
<th>&lt;=1099</th>
<th>1100-1199</th>
<th>1200-1299</th>
<th>1300-1399</th>
<th>1400-1499</th>
<th>&gt;=1500</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;=2.99</td>
<td>36.5%</td>
<td>36.9%</td>
<td>37.7%</td>
<td>24.4%</td>
<td>13.6%</td>
<td>0.0%</td>
<td>35.6%</td>
</tr>
<tr>
<td>3.00 – 3.29</td>
<td>46.2%</td>
<td>44.4%</td>
<td>48.7%</td>
<td>53.5%</td>
<td>34.8%</td>
<td>33.3%</td>
<td>46.2%</td>
</tr>
<tr>
<td>3.30 – 3.49</td>
<td>56.1%</td>
<td>50.2%</td>
<td>56.3%</td>
<td>60.2%</td>
<td>73.9%</td>
<td>100.0%</td>
<td>55.6%</td>
</tr>
<tr>
<td>3.50 – 3.69</td>
<td>55.2%</td>
<td>50.8%</td>
<td>70.6%</td>
<td>77.0%</td>
<td>60.0%</td>
<td>66.7%</td>
<td>61.5%</td>
</tr>
<tr>
<td>3.70 – 3.99</td>
<td>56.8%</td>
<td>61.7%</td>
<td>69.5%</td>
<td>72.7%</td>
<td>79.3%</td>
<td>94.4%</td>
<td>67.2%</td>
</tr>
<tr>
<td>&gt;=4.00</td>
<td>61.4%</td>
<td>70.2%</td>
<td>81.9%</td>
<td>79.4%</td>
<td>88.8%</td>
<td>90.9%</td>
<td>79.8%</td>
</tr>
<tr>
<td>Total</td>
<td>47.8%</td>
<td>47.6%</td>
<td>60.9%</td>
<td>66.2%</td>
<td>71.4%</td>
<td>87.1%</td>
<td>54.6%</td>
</tr>
</tbody>
</table>

Note: Missing values on high school GPA and SAT combined were not mean substituted in this case. They were mean substituted in the multivariate models.
Average SAT (combined) Score by Received Merit-based Award

(1995 – 2004 Cohorts of FT/FT Freshmen)

Notes: Re-centered SATC was not mean substituted for missing cases. Merit awards include Scholars' programs and UMBC merit scholarships.
Average High School GPA by Received Merit-based Award

(1995 – 2004 Cohorts of FT/FT Freshmen)

Notes: High school GPA was not mean substituted for missing cases. Merit awards include Scholars' programs and UMBC merit scholarships.
## Placement by Enrolled in the Recommended Math Course the 1st Semester (2000 – 2004 FT/FT Freshman Cohorts)

<table>
<thead>
<tr>
<th>Placement/Course</th>
<th>N</th>
<th>% Followed Recommendation</th>
<th>% Lower-level Course</th>
<th>% Higher-level Course</th>
<th>% No Math</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 099</td>
<td>233</td>
<td>56%</td>
<td>N/A</td>
<td>9%</td>
<td>35%</td>
</tr>
<tr>
<td>MATH 106</td>
<td>2,036</td>
<td>73%</td>
<td>&lt; 0.1%</td>
<td>4%</td>
<td>23%</td>
</tr>
<tr>
<td>ADV1</td>
<td>550</td>
<td>58%</td>
<td>0%</td>
<td>20%</td>
<td>22%</td>
</tr>
<tr>
<td>MATH 100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 115</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 131</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 121</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 106 *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 150</td>
<td>1,628</td>
<td>64%</td>
<td>5%</td>
<td>11%</td>
<td>20%</td>
</tr>
<tr>
<td>MATH 150</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 155</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 151</td>
<td>2,024</td>
<td>61%</td>
<td>3%</td>
<td>12%</td>
<td>25%</td>
</tr>
</tbody>
</table>

• Students who place into ADV1 & plan to take MATH 150 (Pre-Calc) must first complete MATH 106.

Note: Totals may not add to 100% due to rounding.
### 1st Semester Enrollment in a Recommended Math Course, Performance, and Persistence

<table>
<thead>
<tr>
<th>Course Description</th>
<th>2000-2004 Cohorts (n=6,883)</th>
<th>1995-1999 Cohorts (n=5,748)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Retention</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Semester</td>
</tr>
<tr>
<td>FT/FT Freshmen</td>
<td>2,036</td>
<td>91.1%</td>
</tr>
<tr>
<td>Placed into MATH 106 &amp; Took...</td>
<td>1,483</td>
<td>88.7%</td>
</tr>
<tr>
<td>Recommended Course</td>
<td>1,056</td>
<td>91.3%</td>
</tr>
<tr>
<td>A, B, C</td>
<td>351</td>
<td>84.3%</td>
</tr>
<tr>
<td>D or F</td>
<td>71</td>
<td>71.8%</td>
</tr>
<tr>
<td>Withdrew (W or WX)</td>
<td>3</td>
<td>100.0%</td>
</tr>
<tr>
<td>Lower-level Course</td>
<td>86</td>
<td>84.9%</td>
</tr>
<tr>
<td>Higher-level Course</td>
<td>467</td>
<td>89.3%</td>
</tr>
<tr>
<td>No Math</td>
<td>467</td>
<td>89.3%</td>
</tr>
</tbody>
</table>
# 1st Semester Enrollment in a Recommended Math Course, Performance, and Persistence

## 2000-2004 Cohorts (n=6,883)

<table>
<thead>
<tr>
<th>FT/FT Freshmen</th>
<th>N</th>
<th>Retention</th>
<th>1-year</th>
<th>6-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,628</td>
<td>91.1%</td>
<td>82.4%</td>
<td></td>
<td>54.0%</td>
</tr>
<tr>
<td>Placed into MATH 150 &amp; Took...</td>
<td>1,049</td>
<td>90.7%</td>
<td>83.3%</td>
<td>611</td>
</tr>
<tr>
<td>Recommended Course</td>
<td>1,049</td>
<td>90.7%</td>
<td>83.3%</td>
<td>611</td>
</tr>
<tr>
<td>A, B, C</td>
<td>865</td>
<td>91.9%</td>
<td>86.0%</td>
<td>478</td>
</tr>
<tr>
<td>D or F</td>
<td>158</td>
<td>88.0%</td>
<td>72.2%</td>
<td>112</td>
</tr>
<tr>
<td>Withdrew (W or WX)</td>
<td>23</td>
<td>60.9%</td>
<td>60.9%</td>
<td>21</td>
</tr>
<tr>
<td>Lower-level Course</td>
<td>74</td>
<td>90.5%</td>
<td>82.4%</td>
<td>45</td>
</tr>
<tr>
<td>Higher-level Course</td>
<td>185</td>
<td>93.0%</td>
<td>84.3%</td>
<td>87</td>
</tr>
<tr>
<td>No Math</td>
<td>324</td>
<td>92.6%</td>
<td>84.3%</td>
<td>259</td>
</tr>
</tbody>
</table>
## 1st Semester Enrollment in a Recommended Math Course, Performance, and Persistence

<table>
<thead>
<tr>
<th>Course Status</th>
<th>2000-2004 Cohorts (n=6,883)</th>
<th>1995-1999 Cohorts (n=5,748)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Retention</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Semester</td>
</tr>
<tr>
<td>FT/FT Freshmen</td>
<td></td>
<td>91.1%</td>
</tr>
<tr>
<td>Placed into MATH 151 &amp; Took...</td>
<td>2,024</td>
<td>94.5%</td>
</tr>
<tr>
<td>Recommended Course</td>
<td>1,228</td>
<td>96.0%</td>
</tr>
<tr>
<td>A, B, C</td>
<td>1,051</td>
<td>90.2%</td>
</tr>
<tr>
<td>D or F</td>
<td>137</td>
<td>86.1%</td>
</tr>
<tr>
<td>Withdrew (W or WX)</td>
<td>38</td>
<td>84.2%</td>
</tr>
<tr>
<td>Lower-level Course</td>
<td>50</td>
<td>96.0%</td>
</tr>
<tr>
<td>Higher-level Course</td>
<td>240</td>
<td>93.8%</td>
</tr>
<tr>
<td>No Math</td>
<td>509</td>
<td>96.7%</td>
</tr>
</tbody>
</table>
Conclusions

• Most students who take Math their 1st semester take the advised Math course (~84%).

• Few students who perform poorly in a Math gateway course persist.

• Even among our academically prepared students, more than 20% don’t graduate.
Next Steps

• Analyze the role of other gateway courses?

• Re-evaluate the role of first-year experiences in FT/FT freshman retention.

• Develop a transfer student baseline retention and graduation model, including the role of first-year experiences.

• Examine the role of student behavior after the 1st semester (course-taking, major switching) on persistence.

• Evaluate placement testing methods: paper & pencil vs. computer-based module.