

Low-Income Students in the STEM Pipeline

Intel Visionary Event 2010

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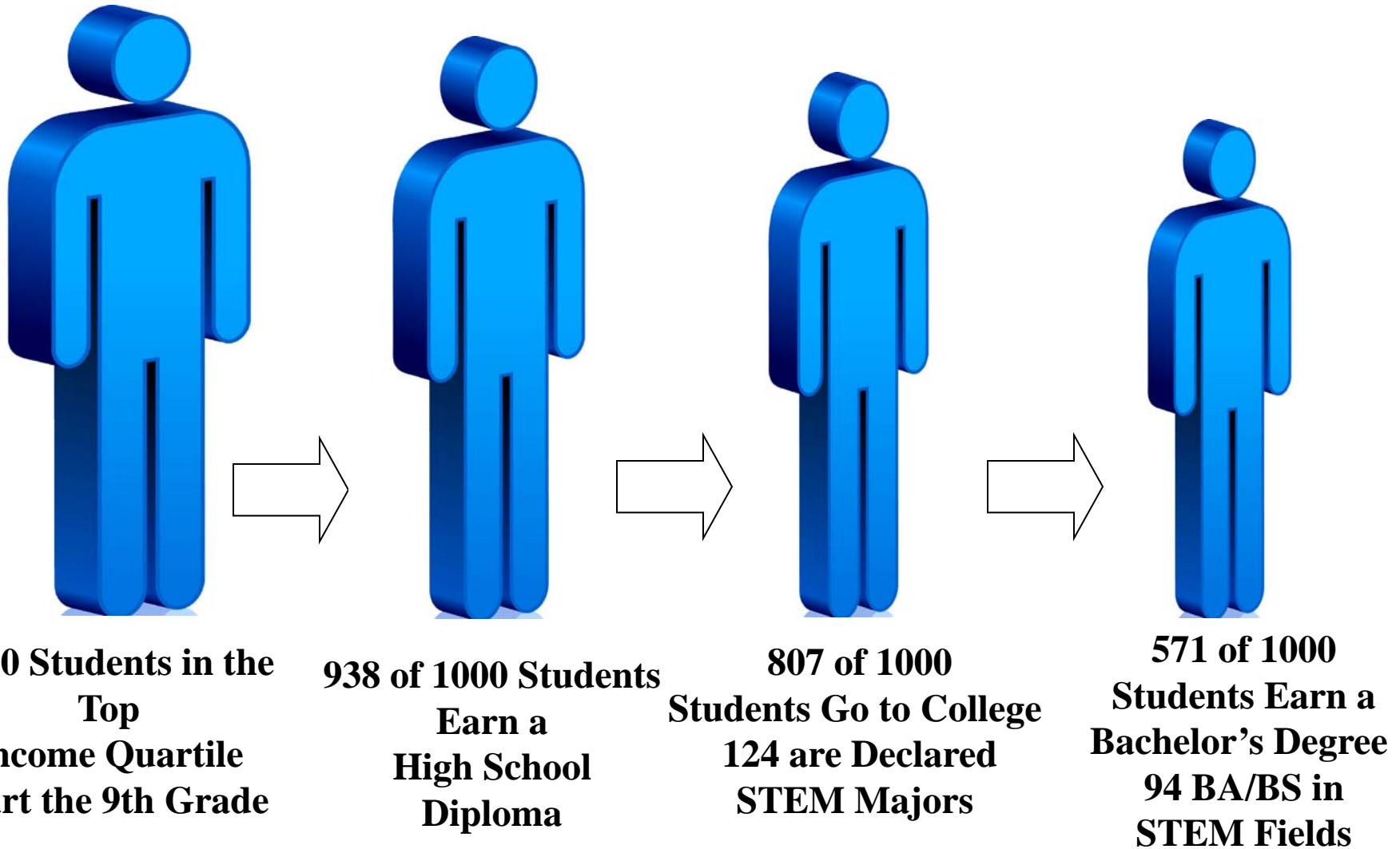
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Starting young is important but don't forget that after middle school students have high school and college to get through as well.

**We are losing large numbers of
low-income students all along
the STEM pipeline.**

STEM Pipeline from 9th Grade to Bachelor's Degree for High-Income Students in the U.S.



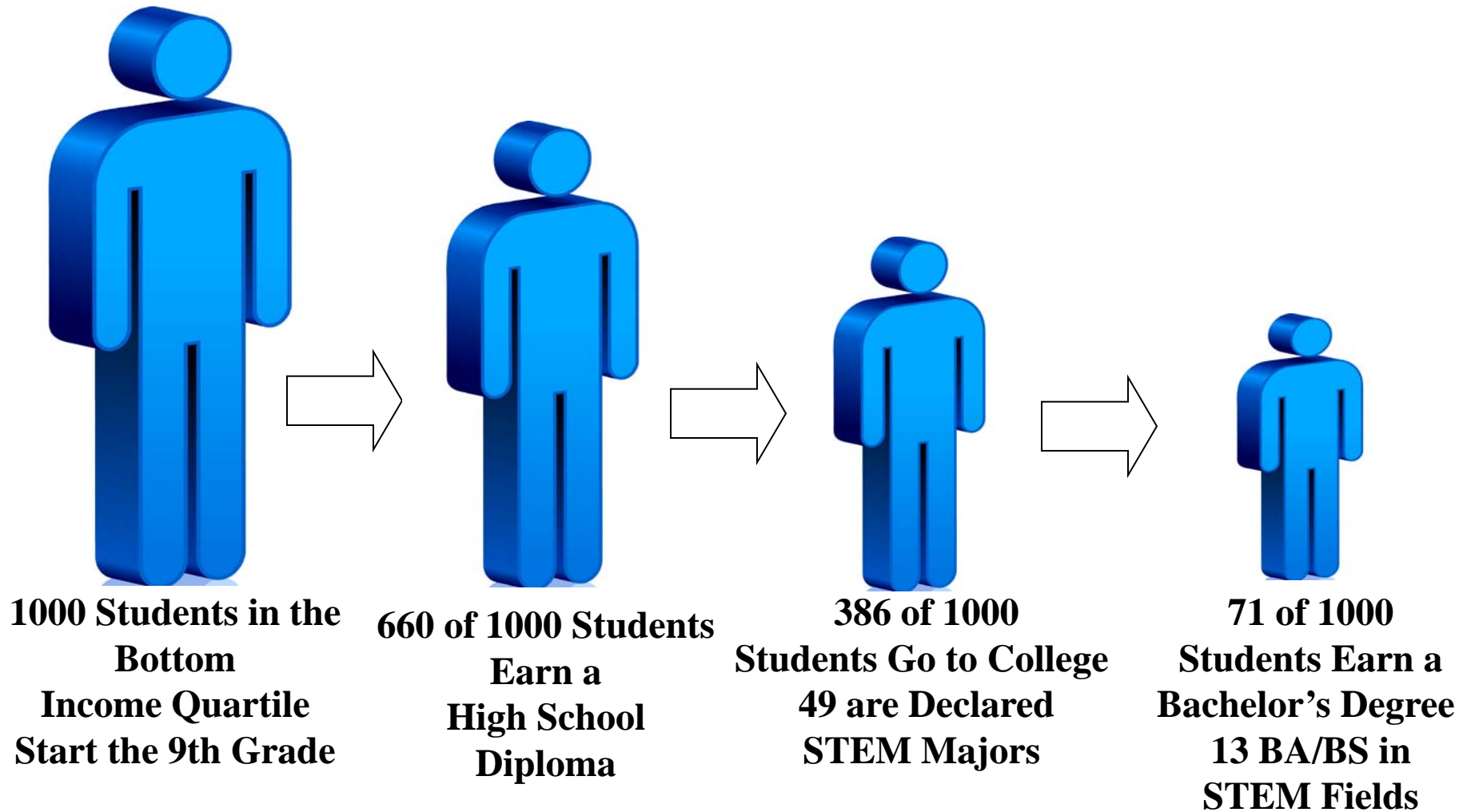
**1000 Students in the
Top
Income Quartile
Start the 9th Grade**

**938 of 1000 Students
Earn a
High School
Diploma**

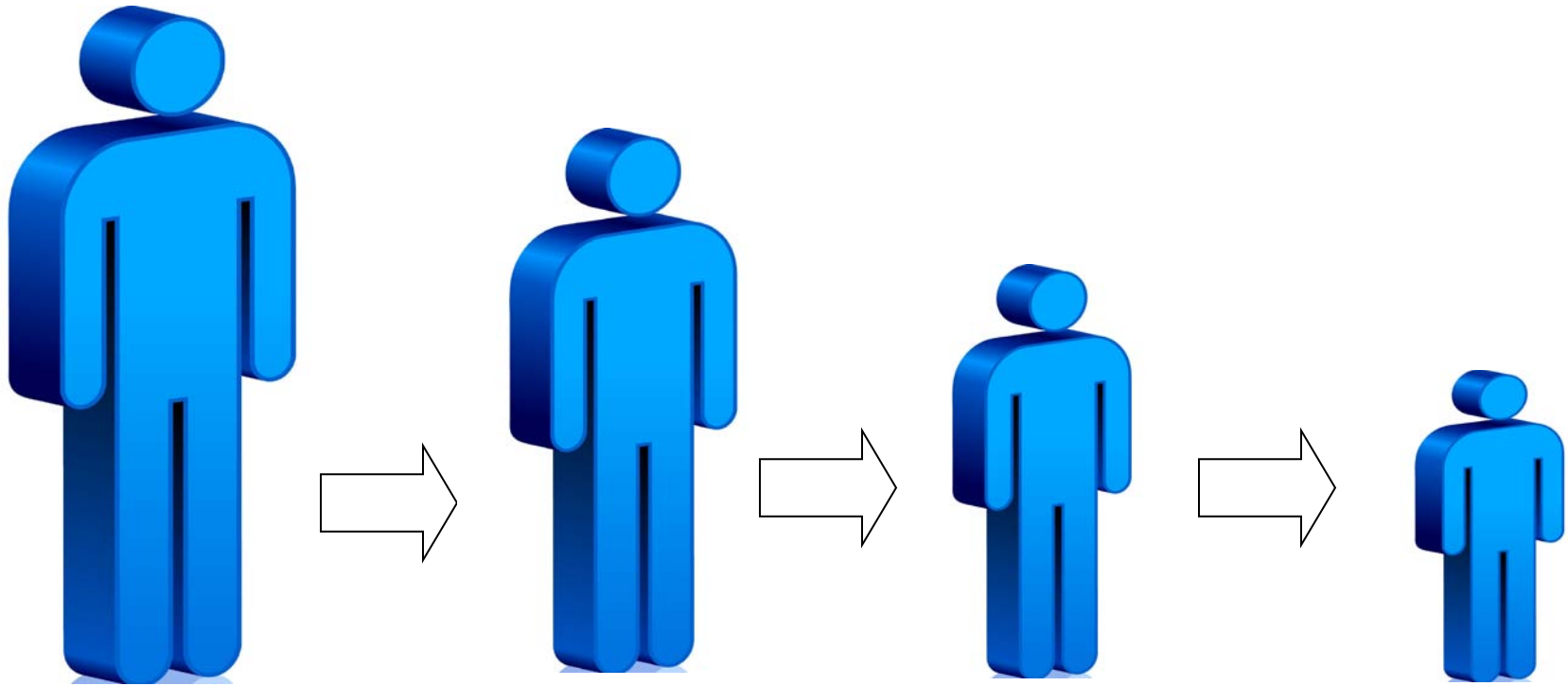
**807 of 1000
Students Go to College
124 are Declared
STEM Majors**

**571 of 1000
Students Earn a
Bachelor's Degree
94 BA/BS in
STEM Fields**

STEM Pipeline from 9th Grade to Bachelor's Degree for Low-Income Students in the U.S.



STEM Pipeline from 9th Grade to Bachelor's Degree for Low-Income Students in the U.S.



**A 9th grader in the Bottom
Income Quartile**

**Relative to the total
9th grade population**

**Has a 0.3% chance of
graduating with a
BA/BS in a STEM Field**

Note: A High-Income 9th grader has a 24% chance of graduating with a BA/BS in a STEM field.

Impact of Poverty on High Schools

- **Lack of Equal Access to:**
 - Experienced, high-performing teachers
 - Advanced Courses (e.g. AP, IB, courses which meet the requirements for the state flagship institution)
- **High teacher to student ratios leading to dysfunctional maintenance of standards**
 - Tracking and Expectations
 - Lack of College Going Culture

Impact of Poverty on High Schools

- **Loss of Community Based Schools**
 - Most principals, teachers and counselors no longer live in the community that they serve
- **Loss in Understanding the Social and Cultural Capital of the Community**
- **Students Do Not Acquire the Social and Cultural Capital Necessary to Succeed in Postsecondary Education**

Impact of Poverty in College

- Students start the first day of college in DEBT:
 - Financial Debt
 - Social Capital Debt
 - Cultural Capital Debt
 - Academic Debt

How does Academic Debt Occur?

- Notions of achievement and scholarship in preparing for college
- Problems manifest itself in first-year course taking and performance
- Problems compounded by financial debt
- Problems compounded by institutional response to students' lack of social and cultural capital

The End Result:

**Low-Income Students are
Turning Away from STEM Majors**

Low-Income Students Leaving STEM Majors

Currently, Without Proper Academic Support, Pell Grant Recipients Are Leaving the STEM Majors After Two Years of College!

- 48% of freshmen who declared STEM majors in physical sciences leave these majors
- 65% of freshmen who declared STEM majors in life sciences leave these majors
- 49% of freshmen who declared STEM majors leave these majors

Throwing \$ at the Problem does Not Solve the Problem

In 2006, Congress created the National Science and Mathematics Access to Retain Talent (SMART) Grant program to provide financial assistance to Pell Grant-eligible college juniors and seniors to pursue degrees in the fields of science, technology, engineering, and mathematics (STEM). Congress authorized **\$1.64 billion** for this program and the Academic Competitiveness Grant (ACG), a companion program for Pell-Grant eligible college freshmen and sophomores.

Throwing \$ at the Problem does Not Solve the Problem

- Only 60,976 SMART Grants were awarded in 2006-07 and 66,120 in 2007-08.
- Approximately, 44% (just over \$700,000,000) of these funds were not awarded—this is potentially 175,000 SMART Grant awards over two years.
- Roughly 12% of Pell recipients major in STEM fields. This means that in 2006-07 alone, there were approximately **620,000 Pell recipients majoring in STEM.**

Performance in STEM Majors

Pell Grant Recipients Perform Well Enough to Participate in Undergraduate Research Programs Yet Do Not Qualify for SMART Grants*

At the end of the freshman year:

- Pell STEM majors in the physical sciences average a 2.77 GPA
- Pell STEM majors in the life sciences average a 2.81 GPA
- All Pell STEM majors average a 2.78 GPA

After two years in college:

- Pell STEM majors in the physical sciences average a 2.75 GPA
- Pell STEM majors in the life sciences average a 3.16 GPA
- All Pell STEM majors average a 2.82 GPA

***NOTE:** The SMART Grant qualification is a 3.00 GPA or above—however McNair, MBRS, and LSAMP undergraduate research programs also accept STEM majors with 2.70 to 2.99 GPA's.

Persistence in STEM Majors

The Nature of STEM Program Study Further Jeopardizes Pell Recipients' Eligibility for SMART Grants*

Average percent of declared Pell STEM majors **below class level** after two years in college:

- 48.3% STEM-physical science majors
- 27% STEM-life science majors
- 43% STEM majors

***NOTE:** Pell STEM majors are progressing in earned units but are missing units to be at or above class level. This is a concern with new HEOA changes requiring students to be at class level to qualify for AC and SMART Grants.

Things Aren't All Bad

Continuity with Innovation

- Sustaining Programs are Critical for Low-Income Communities – Consistency is Important.
- Investment in Long-Standing Programs for Low-Income Students has Long-Term Results.

Without TRIO Upward Bound

Without Upward Bound - Yearly Approximate Economic Cost and Contribution at age 26 years of 12,000 adults who were high school sophomores at risk of dropping out of public high school and below the 60th percentile SES

(Based on calculated degree attainment rates from NELS 88/00 and rates and mean costs for incarceration, public assistance, unemployment, and employment by degree attained)

Status of Adults at age 26 years	Less than High School	High School Graduate	Some College, No Degree	Associate' Degree	Bachelor's Degree	Master's Degree	Doctorate/ Professional Degree	Total \$	Net Gain \$
Incarceration	-130	-82	-58	-10	-3	0	0		
Public Assistance	-804	-1081	-125	-21	-34	-2	0		
Unemployed	-41	-101	-260	-32	-39	-2	0		
Employed	412	1663	4834	832	1357	65	12		
Total adults by Degree attained	1387	2927	5277	895	1433	69	12		
Cost to Government	-\$18,663,200	-\$23,175,500	-\$4,710,300	-\$704,700	-\$687,600	-\$33,400	\$0	-\$47,974,700	
Federal Income Taxes	\$1,709,000	\$10,144,300	\$37,946,900	\$6,958,000	\$18,167,500	\$1,062,300	\$329,100	\$76,317,100	\$28,342,400

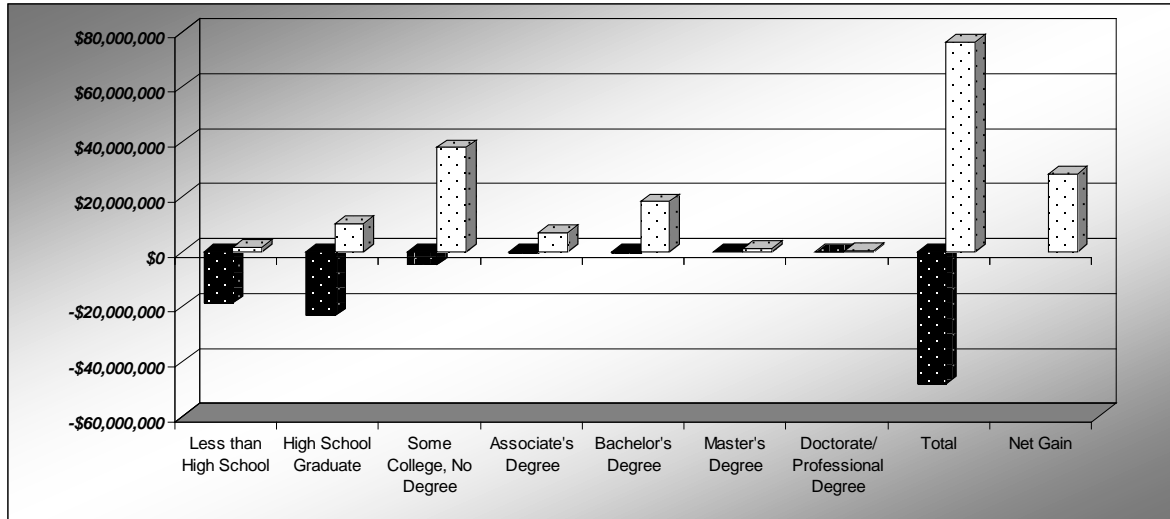
With TRIO Upward Bound

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(Based on calculated degree attainment rates from NELS 88/00 and rates and mean costs for incarceration, public assistance, unemployment, and employment by degree attained)

Status of Adults at age 26 years	Less than High School	High School Graduate	Some College, No Degree	Associate's Degree	Bachelor's Degree	Master's Degree	Doctorate/ Professional Degree	Total \$	Net Gain
Incarceration	-19	-40	-78	-10	-4	0	0		
Public Assistance	-118	-531	-167	-22	-50	-2	-5		
Unemployed	-6	-54	-347	-33	-57	-2	-4		
Employed	60	813	6466	857	1979	88	188		
Total by degree attained	203	1438	7058	922	2090	92	197		
Cost to Government	-\$2,736,800	-\$11,429,300	-\$6,303,700	-\$721,000	-\$997,400	-\$33,400	-\$75,500	-\$22,297,100	
Federal Income Taxes	\$248,900	\$4,959,300	\$50,758,100	\$7,167,100	\$26,494,900	\$1,438,200	\$5,155,900	\$96,222,400	\$73,925,300

Without TRIO Upward Bound

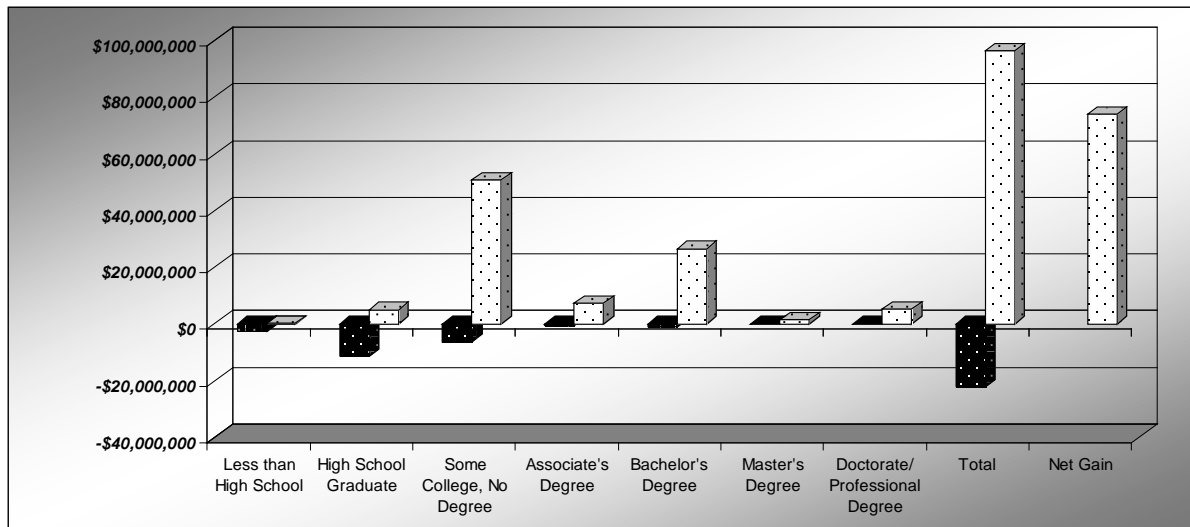


This is a difference of \$45.6 million for one year.

If contribution stays consistent, the total contributions from age 26 to 65 years of age are:

With Upward Bound approximately \$2.89 billion

With TRIO Upward Bound



Without Upward Bound approximately \$1.092 billion

This is a difference of \$1.798 billion. So investing \$240 million on 12,000 at risk students leads to a return on investment of \$1.56 billion.

Practices Worthy of Attention

- Providing and Sustaining Significant Resources
- Sustained Program Overtime
- Strong/Comprehensive Institutional Support
- Relevant Curriculum that Builds Foundational Knowledge and Develops Critical Thought
- Establish a Sense of Place for Students in the Academy, School, etc.
- Link and Sustain Personal and Academic Support through Education System/Pipeline

Practices Worthy of Attention

- Support Services that Include Child Care
- Use Cohort Model instead of Apprenticeship Model in Research and Internship Programs
- Use of Traditional/Community Knowledge in Curriculum
- Link Academic Language to Traditional Knowledge and Language
- Involve Families, Community, and Community Elders
- Demonstrate how students can use experience to give back to their community

Sources and Notes

1. *U.S. Department of Education, National Center for Education Statistics, 1995–96 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:96/01)*
2. *U.S. Department of Education, National Center for Education Statistics, 2001 Baccalaureate and Beyond Longitudinal Study (B&B:2000/01)*
3. *Thomas Mortenson, postsecondary.org, Bachelor's Degree Attainment by Age 24 by Family Income Quartiles, 1970 to 2005*
4. *U.S. Department of Education's National Center for Education Statistics: Beginning Postsecondary Students (BPS) Survey Cohorts 96/98 and 04/06.*
5. *Pell, AC, and SMART grant data drawn from the U.S. Department of Education website.*
6. *U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study (NELS:1988/2000)*