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MINORITY PARTICIPATION IN TECHNOLOGY BASED GROWTH INDUSTRIES IN NORTHEAST OHIO

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INTRODUCTION

This report was prepared for PolicyBridge and NorTech by the Center for Economic Development at the Levin College of Urban Affairs at Cleveland State University. The study uses secondary data sources to analyze minority participation in technology-based growth industries. This study complements research conducted by Policy Bridge, which is primarily based on interviews and focus groups; it assists these organizations in drafting policy recommendations on how to increase the role of minorities in technology based growth industries.

This report is organized into three chapters: Minority Participation in STEM Degrees, Minority Participation in High-Tech Industries, and Minority Business Ownership. Each chapter contains the same structure: a summary of findings based on information and data contained within the chapter followed by an analysis conducted by the Center for Economic Development. In most instances, the Center's analysis includes a graphic or table followed by bullet points highlighting the observations of data collected and studied. To create a benchmarking system, the Center compared the Northeast Ohio region and its counties to the state of Ohio and the United States.

CHAPTER 1: MINORITY PARTICIPATION IN STEM DEGREES

This analysis examines university degrees awarded in science, technology, engineering, and mathematics (STEM)[1] to minority students in Northeast Ohio. In order to create a benchmarking system, the report compared Northeast Ohio[2] to the state of Ohio and the United States. In this report, graphics and tables are displayed, followed by bullet points highlighting the observations of data collected and studied.

For this analysis, information about degrees awarded by race from colleges and universities was gathered from the National Science Foundation (NSF) Integrated Postsecondary Education Data System. The NSF categorizes many degree types that are familiar to this report's audience, but definitions are provided for the infrequently referred to degree types: First Professional Degrees,[3] Post-Master's Certificates,[4] and Doctorate Degree-Professional Practice.[5] For the purposes of this study, the terms "minority" and "minorities" refer to African-Americans and Hispanics only. In addition, the racial grouping Asians encompasses Asians and Pacific Islanders.

MAJOR FINDINGS

In 2009, twenty-eight (28) academic institutions in the Northeast Ohio region granted 740 degrees in the STEM disciplines to minority students; degrees ranged from the associate to the doctorate level.[6] The five largest universities—Case Western Reserve University, Cleveland State University, Kent State University, University of Akron, and Youngstown State University—awarded the majority of *Bachelor's* and *Graduate* STEM degrees (335) to minority students. Cuyahoga Community College awarded the highest number of *Associate's Degrees* (112) in STEM.

Examining the percentage of degrees awarded in STEM disciplines by racial/ethnic categories reveals interesting trends. The percentage of STEM degrees awarded, out of all degrees awarded, was similar across geographies (Northeast Ohio, Ohio, and the United States); however, African-American and Hispanic students, no matter the geography, accounted for lower percentage of degrees awarded in STEM fields than other racial/ethnic categories. In contrast, Asians had the highest STEM share of all degrees awarded in all geographies. When comparing the percentage of STEM degrees awarded out of all STEM degrees awarded within a particular racial/ethnic category in Northeast Ohio, African-American STEM degrees accounted for 6.1% and Hispanics accounted for 1.6%.

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[1] For a listing of STEM degree disciplines included in this study, see Appendix Table A.1. Listing of STEM Academic Disciplines.

[2] The Northeast Ohio region is defined for this study as the 11-county region that includes Ashtabula, Cuyahoga, Geauga, Lake, Lorain, Mahoning, Medina, Portage, Stark, Summit, and Trumbull counties. These counties were selected because they had at least 5% of minorities among their residents. Other Northeast Ohio counties where the minority population accounted for less than 5% were excluded from this study.

[3] Degrees Awarded in the following 10 areas: Chiropractic (D.C. or D.C.M.), Osteopathic medicine (D.O.), Dentistry (D.D.S. or D.M.D.), Pharmacy (Pharm.D.), Law (L.L.B. or J.D.), Podiatry (D.P.M., D.P., or Pod.D.), Medicine (M.D.), Theology (M.Div., M.H.L., B.D., or Ordination), Optometry (O.D.), and Veterinary medicine (D.V.M.).

[4] A certificate one has achieved after receiving a Master degree.

[5] A doctor's degree that is conferred upon completion of a program providing the knowledge and skills for the recognition, credential, or license required for professional practice. The degree is awarded after a period of study such that the total time to the degree, including both pre-professional and professional preparation, equals at least 6 full-time-equivalent academic years.

[6] For a listing of Northeast Ohio degree granting institutions included in this report and the number of STEM degrees awarded, see Appendix Table A.2. List of 2- and 4- Year Institutions and Number of STEM Degrees Awarded to Minorities in Northeast Ohio, 2009.

When comparing Northeast Ohio to the state of Ohio and the United States, it is important to take into consideration the minority share of the population aged 25-years and above that resides within each geographic area. In short, if a locality does not have a large minority population, then it cannot have a high participation rate. In order to evaluate this comparison, the STEM degree share of shares calculates STEM graduation rates in relation to the size of the minority population in a geographic region; if this measure equals one, the STEM graduation rate equals the relative size of the minority population in that geography. For African-Americans in Northeast Ohio, the share of shares was 0.44, indicating that a lower amount of African-Americans graduate with STEM degrees in proportion to their share in the Northeast Ohio population. This measure is less than the state of Ohio ratio (0.56) and the United States ratio (0.69). Hispanics in Northeast Ohio, on the other hand, reported a share of shares of 0.68, which is closer to 1.00, with Ohio reporting a larger share of shares (0.73) and the nation a lower value (0.48). As noted above, Asians had a high proportion of degrees awarded in STEM fields, and Asians across all regions reported a significant share of shares: 3.21 in Northeast Ohio, 2.32 in Ohio, and 1.84 in the United States. This indicates that Asians earn a greater share of STEM degrees than their proportion of the population over the age of 25.

These findings suggest that new policies are needed to incentivize higher participation of college-bound minorities in major STEM disciplines. The fact that African-Americans and Hispanics had lower percentages of degrees awarded in STEM disciplines than other racial and ethnic groups may reduce their probability of working and advancing in high-tech growth industries that are drivers of the regional economy. This could in turn lead to having fewer opportunities both to participate in regional economic growth and to accumulate personal wealth.

ANALYSIS OF STEM DEGREES AWARDED

OVERALL

STEM SHARE OF ALL DEGREES AWARDED BY RACIAL GROUP

Table 1. STEM Share of All Degrees Awarded By Racial Group, 2009

	Northeast Ohio (11-County)			Ohio			United States		
	Total degrees awarded	STEM degrees awarded	% of STEM degrees awarded	Total degrees awarded	STEM degrees awarded	% of STEM degrees awarded	Total degrees awarded	STEM degrees awarded	% of STEM degrees awarded
African-Americans	2,484	583	23.5%	8,545	2,095	24.5%	288,299	66,339	23.0%
Asians	878	458	52.2%	2,788	1,254	45.0%	186,020	70,866	38.1%
Hispanics	516	157	30.4%	2,086	527	25.3%	237,064	50,627	21.4%
Whites	22,335	7,319	32.8%	87,285	27,686	31.7%	1,962,690	540,433	27.5%
All Other Racial Groups	2,763	1,106	40.0%	11,367	4,227	37.2%	399,362	122,448	30.7%
TOTAL	**28,976**	**9,623**	**33.2%**	**112,071**	**35,789**	**31.9%**	**3,073,435**	**850,713**	**27.7%**

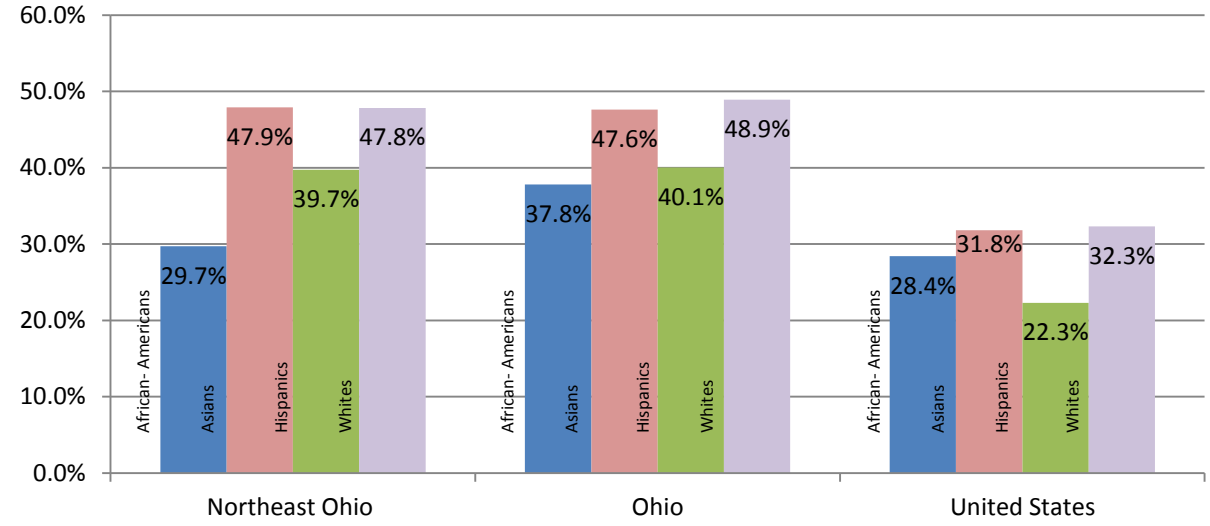
Source: National Science Foundation

- Examining the percentage of STEM degrees awarded out of the total amount of degrees awarded by each racial/ethnic category identifies that no matter the racial/ethnic category and geography more than 20% of students graduated with degrees in STEM (Table 1).
- In Northeast Ohio, STEM degrees accounted for similar shares for Hispanics (30.4%) and Whites (32.8%), while African-Americans reported a smaller share of STEM degrees (23.5%). Asians surpassed all other racial/ethnic categories with over half graduating with STEM degrees (52.2%).
- The Northeast Ohio share of STEM degrees for African-Americas (23.5%) was slightly lower than the state of Ohio (24.5%), but slightly higher than the United States (23.0%).
- The Hispanic share of STEM degrees in Northeast Ohio (30.4%) was higher than both the state of Ohio (25.3%) and the United States (21.4%).
- For all other racial groups,[7] the share of STEM degrees in Northeast Ohio (40.0%) was higher than both the state of Ohio (37.3%) and the United States (30.4%). Across all regions, this category earned a higher share than all other racial groups except Asians.

[7] All other racial groups include: American Indian or Alaska Native, Temporary residents, and Unknown Races & Ethnicities.

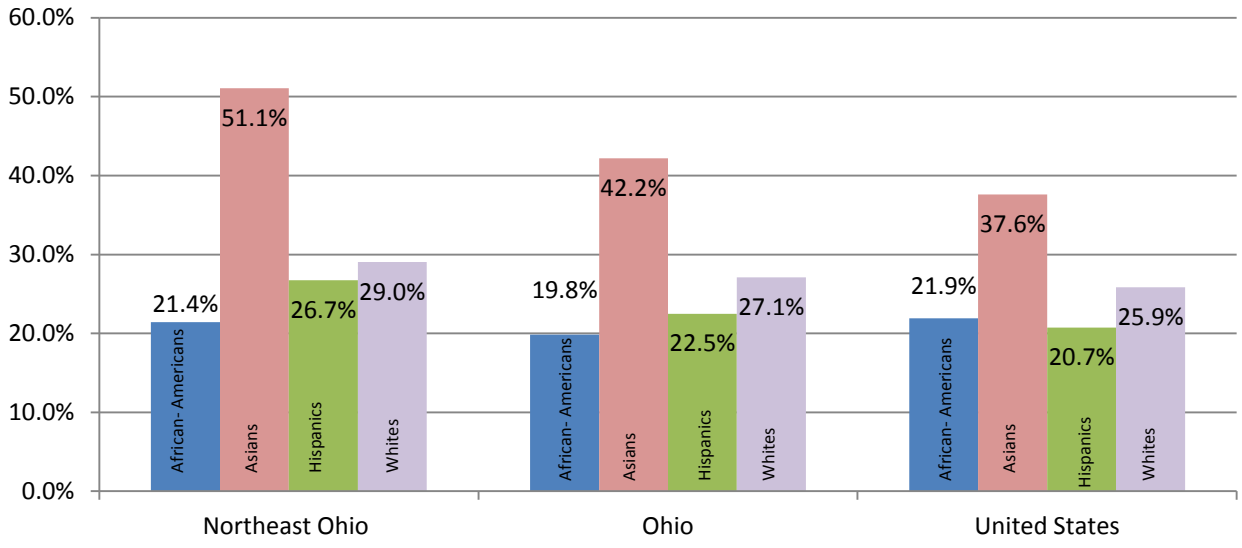
Figures 1-4 examine STEM participation rates by degree for each racial/ethnic group. For more information by degree type, see Appendix Table A. 3. STEM Percentage by Degree Type for Each Ethic/Racial Group, 2009.

Figure 1. STEM Percentage of Total Associate's Degrees Awarded By Racial Group, 2009



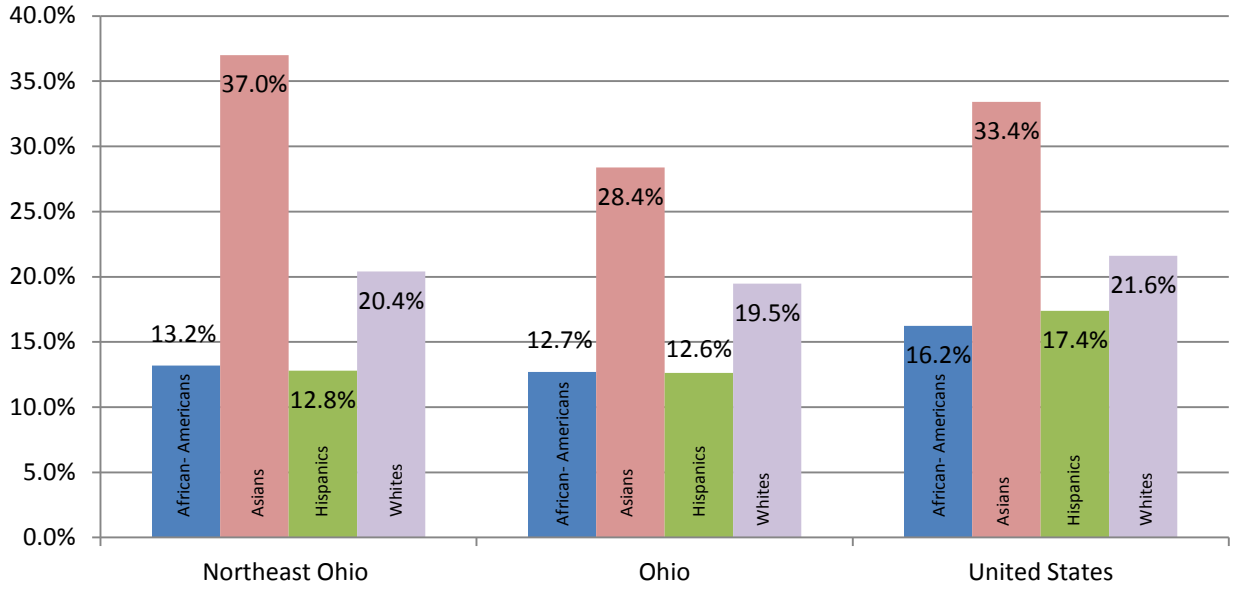
Source: National Science Foundation

Figure 2. STEM Percentage of Total Bachelor's Degrees Awarded By Racial Group, 2009



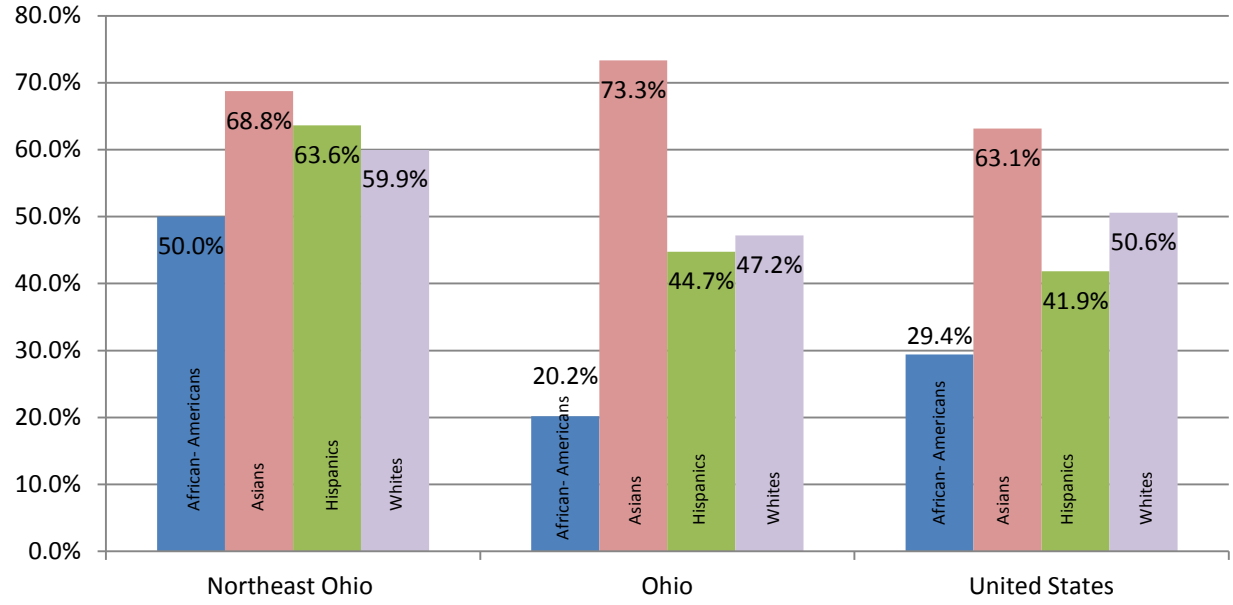
Source: National Science Foundation

Figure 3. STEM Percentage of Total Master's Degrees Awarded By Racial Group, 2009



Source: National Science Foundation

Figure 4. STEM Percentage of Total Doctorate Degrees Awarded By Racial Group, 2009



Source: National Science Foundation

Table 2 presents the share of shares of degrees awarded by racial/ethnic group in Northeast Ohio, the state of Ohio, and the United States. Share of shares compares the percent of degrees awarded by racial/ethnic group[8] to the percentage of that racial/ethnic group in the total population.[9] If the share of shares is equal to one, then the share of degrees awarded to a racial/ethnic group equals the proportion of that group in the respective population.

Table 2. Share of STEM Degrees as a Share of Population Over 25 Years by Racial/Ethnic Group, 2009

	Northeast Ohio (11- County)			Ohio			United States		
	Share of STEM Degrees	Share of Pop over 25 yrs	Share of Shares	Share of STEM Degrees	Share of Pop over 25 yrs	Share of Shares	Share of STEM Degrees	Share of Pop over 25 yrs	Share of Shares
Whites	75.73%	83.08%	**0.91**	77.36%	86.20%	**0.90**	63.53%	77.35%	**0.82**
African-Americans	6.03%	13.73%	**0.44**	5.85%	10.51%	**0.56**	7.80%	11.27%	**0.69**
Hispanics	1.62%	2.40%	**0.68**	1.47%	2.01%	**0.73**	5.95%	12.37%	**0.48**
Asians	4.74%	1.47%	**3.21**	3.50%	1.51%	**2.32**	8.33%	4.52%	**1.84**

Sources: American Community Survey, 2005-2009 Estimates; National Science Foundation

- For African-Americans in the Northeast Ohio region, the share of shares (the share of degrees earned in Northeast Ohio as a ratio of the share of the population over the age of 25) was 0.44. This was less than the ratios for the state of Ohio (0.56) and the United States (0.69).

- The share of shares for Hispanics in Northeast Ohio was 0.68. The corresponding share of shares was 0.73 in the state of Ohio and 0.48 in the United States.

- Whites in the Northeast Ohio region scored 0.91 for their share of shares. This was similar to the Ohio ratio of 0.91 and above the United States ratio of 0.82.

- Asians across all regions reported a significant share of shares: 3.21 in Northeast Ohio, 2.32 in the state of Ohio, and 1.84 in the United States. This indicates that Asians earned a greater share of STEM degrees in all regions when compared to their proportion of the respective populations over the age of 25.

[8] *Source:* National Science Foundation
[9] *Source:* American Community Survey, 2005-2009 Estimates

African-American and Hispanics Combined

STEM Degrees Awarded to Minorities as a Share of All STEM Degrees

- The total number of STEM degrees (associate to doctorate) awarded to African-Americans and Hispanics in Northeast Ohio (740) constituted 7.7% of all degrees awarded in STEM disciplines (9,623). This was similar to the ratio in Ohio (7.3%), but significantly lower than the ratio in the United States (13.8%) (Table 3).

- Of the 740 STEM degrees awarded to African-Americans and Hispanics in Northeast Ohio, the largest numbers were *Bachelor's Degrees* (310, 41.9%), closely followed by *Associate's Degrees* (303, 40.9%).

- The STEM *Associate's Degrees* awarded to African-Americans and Hispanics accounted for 10.1% of all STEM *Associate's Degrees* awarded to students of all races. The Northeast Ohio share was slightly higher than that of the state of Ohio (9.9%), but fell significantly below the share of African-Americans and Hispanics that earned STEM *Associate's Degrees* at the national level (19.1%).

- The share of minorities receiving STEM *Bachelor's Degrees* had a similar pattern to that of *Associate's Degrees*, although the gap between Northeast Ohio and the United States was smaller: 7.2% in Northeast Ohio, 6.8% in the state of Ohio, and 13.6% in the United States.

- For more information on STEM Degrees Awarded to Whites and Asians see:
    - Appendix Table A.4. Share of STEM Degrees Awarded to Whites of All Degrees Awarded to Whites, 2009.
    - Appendix Table A.5. Share of STEM Degrees Awarded to Asians of All Degrees Awarded to Asians, 2009.

Table 3. African-American and Hispanic Shares of STEM Degrees Awarded, 2009

	Northeast Ohio (11- County)			Ohio			United States		
Level of STEM Degrees	STEM Degrees for All Racial Groups	AA/Hispanic STEM Count	% of AA/Hispanic STEM Degrees Awarded	STEM Degrees for All Racial Groups	AA/Hispanic STEM Count	% of AA/Hispanic STEM Degrees Awarded	STEM Degrees for All Racial Groups	AA/Hispanic STEM Count	% of AA/Hispanic STEM Degrees Awarded
Associate's Degree	2,989	303	10.1%	11,112	1,105	9.9%	212,355	40,450	19.1%
Bachelor's Degree	4,326	310	7.2%	16,170	1,105	6.8%	404,036	54,786	13.6%
First Professional Degree	428	36	8.4%	996	66	6.6%	22,562	2,531	11.2%
Master's Degree	1,400	69	4.9%	5,139	238	4.6%	152,960	15,138	9.9%
Post-Master's Certificate	17	1	5.9%	51	4	7.8%	2,758	235	8.5%
Doctorate Degree	395	18	4.6%	1,265	41	3.2%	33,549	1,901	5.7%
Doctorate Degree-Professional Practice	68	3	4.4%	1,056	63	6.0%	22,493	1,925	8.6%
TOTAL	**9,623**	**740**	**7.7%**	**35,789**	**2,622**	**7.3%**	**850,713**	**116,966**	**13.8%**

Source: National Science Foundation

AFRICAN-AMERICANS

STEM DEGREES AWARDED TO AFRICAN-AMERICAS AS A SHARE OF ALL STEM DEGREES

- A total of 583 STEM degrees were awarded to African-Americans in the Northeast Ohio region in 2009. Of all the STEM degrees awarded to African-Americans, the majority was at the *Associate's* (241 degrees) and *Bachelor's* (244 degrees) levels (Table 4).

- Of the STEM *Associate's Degrees*, 87 were in *Life Sciences*, fifty (50) were awarded by Cuyahoga Community College and 11 by Lakeland Community College. In addition, 76 *Associate's Degrees* awarded to African Americans were earned in *Health Technologies*, of which more than one-third was awarded by Cuyahoga Community College (28).

- Of all STEM *Bachelor's Degrees*, 126 were in the field of *Life Sciences*. The universities awarding these degrees included The University of Akron (29), Ursuline College (28), Cleveland State University (24), Kent State University (16), and Youngstown State University (15).

- Of all STEM *Master's Degrees* in Northeast Ohio, 25 were awarded in *Life Science* disciplines.

- Although the share of African-Americans in Northeast Ohio was higher than in the United States, the share of STEM degrees awarded to African-Americans in NEO was lower than the share in the United States in all type of degrees, except *Post-Master's Certificates*. Why is that? It could be attributed to a different industry and occupation mix in NEO where African-Americans worked traditionally in jobs that did not required higher levels of education. The region needs new policies and strategies that would reverse this trend.

Table 4. African-American Share of STEM Degrees Awarded in Northeast Ohio, the State of Ohio, and the United States, 2009

	Northeast Ohio (11- County)			Ohio			United States		
Level of STEM Degrees	STEM Degrees for All Racial Groups	AA STEM Count	% of AA STEM Degrees Awarded	STEM Degrees for All Racial Groups	AA STEM Count	% of AA STEM Degrees Awarded	STEM Degrees for All Racial Groups	AA STEM Count	% of AA STEM Degrees Awarded
Associate's Degree	2,989	241	8.1%	11,112	948	8.5%	212,355	22,758	10.7%
Bachelor's Degree	4,326	244	5.6%	16,170	835	5.2%	404,036	30,612	7.6%
First Professional Degree	428	26	6.1%	996	50	5.0%	22,562	1,510	6.7%
Master's Degree	1,400	58	4.1%	5,139	190	3.7%	152,960	9,265	6.1%
Post-Master's Certificate	17	1	5.9%	51	4	7.8%	2,758	142	5.2%
Doctorate Degree	395	11	2.8%	1,265	24	1.9%	33,549	1,026	3.1%
Doctorate Degree-Professional Practice	68	2	2.9%	1,056	44	4.2%	22,493	1,026	4.6%
Total Number of Degrees Awarded	**9,623**	**583**	**6.1%**	**35,789**	**2,095**	**5.9%**	**850,713**	**66,339**	**7.8%**
Share of Population 25-years and older [A]	**13.7%**			**10.5%**			**11.3%**		

Notes: [A] Share of population above 25-years-old for Northeast Ohio, Ohio, and the United States = Minority population over 25 years old / regional population over 25-years-old.

Sources: U.S. Census Bureau, 2004-2009 American Community Survey; National Science Foundation

STEM Degrees Awarded to African-Americans as a Share of All Degrees Awarded to African-Americans

- Of a total 2,484 degrees awarded to African-Americans in Northeast Ohio, nearly one quarter (23.5%, 583) were degrees in STEM disciplines (Table 5).

- For African-Americans, Northeast Ohio had similar percentages of graduates with STEM degrees (as a percentage of total degrees awarded) compared to the state of Ohio (24.5%) and the United States (23.0%).

- In Northeast Ohio, of all *Associate's Degrees* awarded to African-Americans, STEM accounted for close to 30%, which fell below the Ohio rate of 37.8%. However, the Northeast Ohio share matched the United States rate of 28.4%.

- In the category of *Bachelor's Degrees*, Northeast Ohio (21.4%) had a rate higher than the state of Ohio (19.8%), but a slightly lower rate than the United States (21.9%).

- Fifty percent (50%; 11) of all *Doctorate Degrees* awarded to African-Americans in the NEO region were awarded in STEM. It is interesting to note that this accounted for nearly half of all STEM *Doctorate Degrees* awarded in the state of Ohio to African-Americans (24). Only 20.2% (24) of all *Doctorate Degrees* awarded in the state of Ohio were awarded in STEM, while the United States reported a higher percentage (29.4%).

Table 5. Share of STEM Degrees Awarded to African-Americans of All Degrees Awarded to African-Americans, 2009

	Northeast Ohio (11- County)			Ohio			United States		
Level of STEM Degrees	Degrees in All Disciplines Awarded to AA	STEM Degrees Awarded to AA	% of AA Degrees in STEM	Degrees in All Disciplines Awarded to AA	STEM Degrees Awarded to AA	% of AA Degrees in STEM	Degrees in All Disciplines Awarded to AA	STEM Degrees Awarded to AA	% of AA Degrees in STEM
Associate's Degree	811	241	29.7%	2,507	948	37.8%	80,076	22,758	28.4%
Bachelor's Degree	1,139	244	21.4%	4,208	835	19.8%	139,655	30,612	21.9%
First Professional Degree	62	26	41.9%	110	50	45.5%	3,471	1,510	43.5%
Master's Degree	440	58	13.2%	1,495	190	12.7%	57,042	9,265	16.2%
Post-Master's Certificate	8	1	12.5%	16	4	25.0%	2,226	142	6.4%
Doctorate Degree	22	11	50.0%	119	24	20.2%	3,489	1,026	29.4%
Doctorate Degree-Professional Practice	2	2	100.0%	90	44	48.9%	2,340	1,026	43.9%
Total Number of Degrees Awarded	**2,484**	**583**	**23.5%**	**8,545**	**2,095**	**24.5%**	**288,299**	**66,339**	**23.0%**

Source: National Science Foundation

HISPANICS

STEM DEGREES AWARDED TO HISPANICS AS A SHARE OF ALL STEM DEGREES

- A total of 157 STEM degrees were awarded to Hispanics in the Northeast Ohio region in 2009; *Associate's Degrees* constituted 39.5% (62) and *Bachelor's Degrees* accounted for 42.0% (66) (Table 6).

- It is interesting to note that almost one-half of STEM *Associate's Degrees* awarded to Hispanics in Northeast Ohio were awarded in *Life Sciences* (28). Of the *Life Sciences Associate's Degrees*, 12 were granted by Lorain County Community College and 10 by Cuyahoga Community College.

- Fifty percent (50%; 33) of STEM *Bachelor's Degrees* were in *Life Sciences* disciplines; nine were awarded by Cleveland State University, seven by Youngstown State University, six by Kent State University, and five by the University of Akron.

- In each type of degree, the share of Hispanics in both Northeast Ohio and state of Ohio was lower than the national share. This was expected given that the United States had much larger share of Hispanics (25-years or older) (12.4%) than Northeast Ohio (2.4%) and the state of Ohio (2.0%).

Table 6. Hispanics Share of STEM Degrees Awarded in Northeast Ohio, the State of Ohio, and the United States, 2009

	Northeast Ohio (11- County)			Ohio			United States		
Level of STEM Degrees	STEM Degrees for All Racial Groups	Hispanic STEM Count	% of Hispanic STEM Degrees Awarded	STEM Degrees for All Racial Groups	Hispanic STEM Count	% of Hispanic STEM Degrees Awarded	STEM Degrees for All Racial Groups	Hispanic STEM Count	% of Hispanic STEM Degrees Awarded
Associate's Degree	2,989	62	2.1%	11,112	157	1.4%	212,355	17,692	8.3%
Bachelor's Degree	4,326	66	1.5%	16,170	270	1.7%	404,036	24,174	6.0%
First Professional Degree	428	10	2.3%	996	16	1.6%	22,562	1,021	4.5%
Master's Degree	1,400	11	0.8%	5,139	48	0.9%	152,960	5,873	3.8%
Post-Master's Certificate	17	-	0.0%	51	-	0.0%	2,758	93	3.4%
Doctorate Degree	395	7	1.8%	1,265	17	1.3%	33,549	875	2.6%
Doctorate Degree-Professional Practice	68	1	1.5%	1,056	19	1.8%	22,493	899	4.0%
Total Number of Degrees Awarded	**9,623**	**157**	**1.6%**	**35,789**	**527**	**1.5%**	**850,713**	**50,627**	**6.0%**
Share of Population 25 years and older [A]		**2.4%**			**2.0%**			**12.4%**	

Notes: [A] Share of population above 25 years for North East Ohio, Ohio, and the United States = Minority population over 25 years/ regional population over 25 years.
Sources: U.S. Census Bureau, 2004-2009 American Community Survey; National Science Foundation

STEM Degrees Awarded to Hispanics as a Share of All Degrees Awarded to Hispanics

- A total of 516 degrees were awarded to Hispanics in Northeast Ohio, one third of which (30.4%, 157) were in STEM disciplines (Table 7).

- For Hispanics, Northeast Ohio had higher percentages of graduates with STEM degrees (as a percentage of total degrees awarded) compared to the state of Ohio (25.3%) and the United States (21.4%).

- In Northeast Ohio, of all *Associate's Degrees* awarded, STEM accounted for close to 40%, which is higher than the percentage in the state of Ohio (37.8%) and much higher than nation (22.3%).

- In the category of *Bachelor's Degrees*, Northeast Ohio (26.7%) had a rate higher than the state of Ohio (22.5%) and the United States (20.7%).

- Northeast Ohio had higher percentages of Hispanic STEM *Doctoral Degree* graduates (63.6%) than the state of Ohio (44.7%) and the United States (41.9%).

Table 7. Share of STEM Degrees Awarded to Hispanics of All Degrees Awarded to Hispanics, 2009

	Northeast Ohio (11- County)			Ohio			United States		
Level of STEM Degrees	Degrees in All Disciplines Awarded to Hispanics	STEM Degrees Awarded to Hispanics	% of Hispanic Degrees in STEM	Degrees in All Disciplines Awarded to Hispanics	STEM Degrees Awarded to Hispanics	% of Hispanic Degrees in STEM	Degrees in All Disciplines Awarded to Hispanics	STEM Degrees Awarded to Hispanics	% of Hispanic Degrees in STEM
Associate Degree	156	62	39.7%	392	157	40.1%	79,369	17,692	22.3%
Bachelor's Degree	247	66	26.7%	1,201	270	22.5%	116,618	24,174	20.7%
First Professional Degree	15	10	66.7%	36	16	44.4%	2,516	1,021	40.6%
Master's Degree	86	11	12.8%	380	48	12.6%	33,799	5,873	17.4%
Post-Master's Certificate	-	-	0.0%	1	-	0.0%	570	93	16.3%
Doctorate Degree	11	7	63.6%	38	17	44.7%	2,091	875	41.9%
Doctorate Degree-Professional Practice	1	1	100.0%	38	19	50.0%	2,101	899	42.8%
Total Number of Degrees Awarded	**516**	**157**	**30.4%**	**2,086**	**527**	**25.3%**	**237,064**	**50,627**	**21.4%**

Source: National Science Foundation

CHAPTER 2: MINORITY PARTICIPATION IN HIGH-TECH INDUSTRIES

This analysis examines the employment, occupations, and educational attainment of minority workers 16-years and older by place of work in the 12-county[10] Northeast Ohio region using data from the American Community Survey Public Use Microdata Sample (PUMS), 2010 1-year data set. In order to create a benchmarking system, we compared the Northeast Ohio region to the United States. For the purposes of this study, the term "minority" refers to African-Americans and Hispanics only. In this report, graphics and tables are displayed, followed by bullet points highlighting the observations of data collected and studied.

MAJOR FINDINGS

Minority participation in Northeast Ohio and Ohio was statistically significantly lower than in the United States in both high-tech and non-high-tech growth cluster industries. Minority participation in high-tech growth clusters in Northeast Ohio (9.4%, ±1.9% with a range from 7.5% to 11.3%) and the state of Ohio (7.5%, ±1.2% with a range from 6.3% to 8.7%) had a statistically significant lower participation share than the United States (15.9%, ±0.3%, with a range from 15.6% to 16.2%). Similarly, the United States (20.9%, ±0.4%) had a statistically significant higher share of minority participation in non-high-tech growth clusters than Northeast Ohio (10.5%, ±1.9%) and the state of Ohio (9.0%, ±1.4%).

Occupational analysis of minorities in Northeast Ohio indicated that minorities had a lower participation rate in math and science occupations. Minorities accounted for only 22.2% of all employees in these occupations while non-minorities accounted for 34.9%. Minorities had statistically significant lower participation rates than non-minorities in three occupational categories: Management; Computer and Mathematical; and Architecture and Engineering.

Examining educational attainment by racial category and industry category shows that minorities working in high-tech-related fields have a higher educational attainment than those working in non-high-tech fields. Of minorities working in high-tech growth clusters, 30.9% or 2,731 (±1,657) had bachelor's degrees or higher, while only 4.0% or 487 (±554) of all minorities working in non-high-tech industries had at least a bachelor's degree. This may suggest that minorities with bachelor's degrees or higher tend to work more often in high-tech industries.

In comparison to the United States, the Northeast Ohio region also has significant ground to cover to increase minority participation rates in growth clusters, science and engineering occupations, and educational attainment in general and in STEM disciplines in particular. The leadership of the region has had the foresight to address these problematic trends by tasking regional economic development organizations with increasing minority participation in growth clusters. If successful, minorities would be better able to participate in and benefit from the future growth of the regional economy.

[10] The Northeast Ohio region is defined for this study as the 12-county region that includes Ashtabula, Carroll, Cuyahoga, Geauga, Lake, Lorain, Mahoning, Medina, Portage, Stark, Summit, and Trumbull counties. These counties were selected because at least 5% of their residents are minorities. Other Northeast Ohio counties whose minority population accounted for less than 5% were excluded from this study. This study includes Carroll County because the PUMS data include Stark and Carroll counties as one unit.

METHODOLOGY

For this analysis, data were gathered from the American Community Survey Public Use Microdata Sample (PUMS), 2010 1-year data set. All data points from the PUMS database are self-reported (including industry classification and racial and ethnic designation). It is also important to note that PUMS data provide estimates as a component of the American Community Survey. This report uses the PUMS data to analyze minority participation in technology-based growth industries. The PUMS counts differ significantly from other databases used specifically to collect administrative data on employment and wages (such as the Quarterly Census of Employment and Wages) because of the sample size and purpose of the database.

Since PUMS data are generated from a survey, margins of error (MOE) are provided to show the variability of the estimates. The MOE is used to estimate the range of possible values in which the estimate can lie, via low and high values (as marked as ±). In a hypothetical example, if the estimate is listed as 250 employees ±25, the actual value lies within a range of values from 225 (250-25) to 275 (225+25); this can be applied to percentages as well. On average, the MOE will be larger for smaller geographies than larger geographies; therefore, the MOE for Northeast Ohio will be larger than that of the United States. When examining minority participation rates across geographic regions, it is important to remember the margin of error rates. If the MOE rates do not overlap between different categories then the percentages are statistically different and the comparison is valid. (In this report, this occurrence can be seen in bar charts that feature error bars.)

The data for the examination of Minority Participation in Technology Based Growth Industries were derived from establishments classified at the 6-digit level by the North American Industry Classification System (NAICS). This represents the finest level of industry detail achievable in the NAICS database. The Center for Economic Development, in conjunction with NorTech and other Northeast Ohio economic development intermediaries, identified NAICS codes for the following clusters: (1) Bioscience; (2) Instruments, Control, and Electronics; (3) Power and Propulsion; (4) Advanced Materials; and (5)Advanced/Alternative Energy.

Following the identification of NAICS codes in these five clusters, it was determined that, due to disclosure limitations, reporting issues, and measurement error of databases used for this project, data for these clusters would be aggregated to a cluster-level designation of either selected high-tech,[11] selected non-high-tech,[12] and all other industries. The selected high-tech industries were chosen from the Northeast Ohio High-Technology Economy Report prepared for NorTech,[13] and the selected non-high-tech industries were the remainder of cluster industries not identified as high-tech industries in that report. All other industries include NAICS industries not designated as high-tech or non-high-tech industries.

[11] For a listing of industries selected as high-tech, see Appendix A.6.
[12] For a listing of industries selected as non-high-tech, see Appendix A.7.
[13] Iryna Lendel, Ph.D. and Sunjoo Park, "Northeast Ohio High-Technology Economy Report" February 10, 2011

ANALYSIS OF TECHNOLOGY-BASED GROWTH INDUSTRIES

EMPLOYMENT ESTIMATES

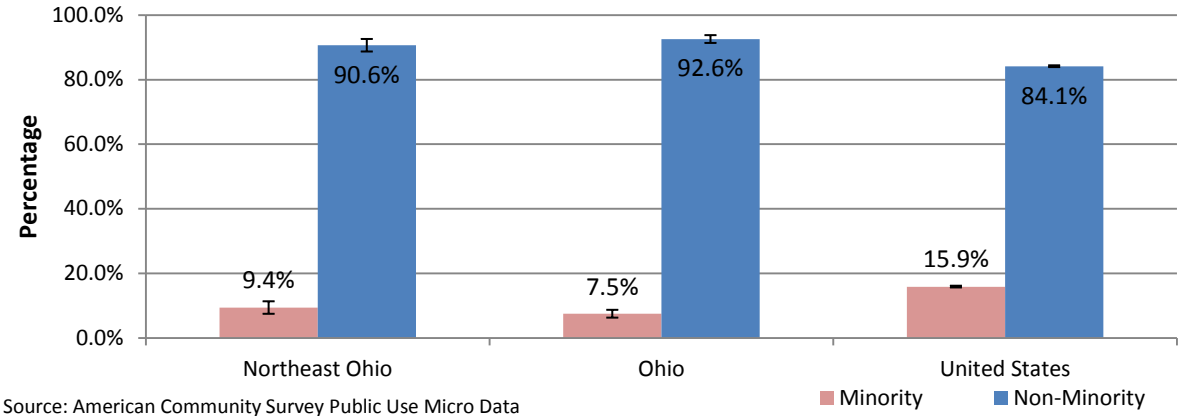
Table 8. Technology-Based Growth Industries: Employment Estimates for Selected High-Tech, Selected Non-High-Tech, and All Other Industries, 2010

	Northeast Ohio				Ohio		United States	
	2010 Employment Count	2010 Estimate MOE	2010 Percent of Total	2010 Percent MOE	2010 Percent of Total	2010 Percent MOE	2010 Percent of Total	2010 Percent MOE
High-Tech								
Minority								
Non-Minority	85,453	5,683	90.6%	1.9%	92.6%	1.2%	84.1%	0.3%
Total								
Non-High-Tech								
Minority								
Non-Minority	104,497	6,283	89.5%	1.9%	91.0%	1.4%	79.1%	0.4%
Total								
All Other Industries								
Minority								
Non-Minority	1,241,778	13,850	83.9%	0.4%	88.1%	0.3%	73.4%	0.1%
Total								

Note: Employment estimates are for workers 16-years and older.
Source: American Community Survey Public Use Microdata Sample

- In 2010, 94,286 workers were employed in high-tech industries in Northeast Ohio. Of those workers, 8,833 were minorities (±2,066). This suggests that minority employment in selected high-tech industries could be between 6,767 and 10,899. Minorities accounted for 9.37% (±1.9%, a range of 7.47% to 11.27%) of employees in high-tech growth industries (Table 8).
- In the non-high-tech industries, 116,740 workers were employed overall, of which 12,243 were minorities (±2,260). This suggests that minority employment in selected non-high-tech industries could range between 9,983 and 14,503, or 10.5% of all employees non-high-tech industries (± 1.9%, a range of 8.6% to 12.4%).
- It is interesting to note that the minority participation rate was higher for all other industries (those not classified as high-tech or non-high-tech). Within this category, there are 237,764 minorities (±7,496, a range of 230,268 to 245,260), which represented 16.1% (±0.4%, a range of 15.7% to 16.5%) of all minority employees.

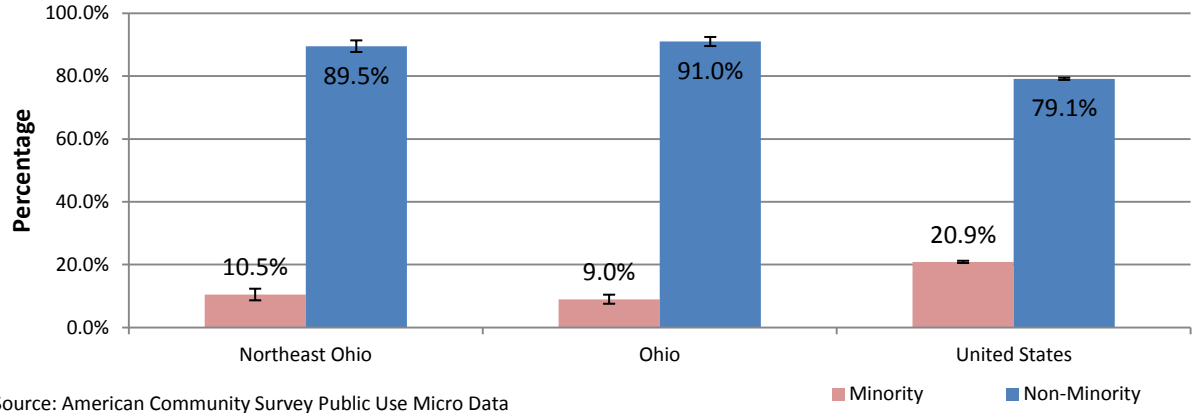
Figure 5. Percentage of Employment Estimates by Minority and Non-Minority Workers for Selected High-Tech Industries in NEO, Ohio, and the U.S., 2010



Source: American Community Survey Public Use Micro Data

- Northeast Ohio (9.4%, ±1.9%)[14] and the state of Ohio (7.5%, ±1.2%)[15] did not have statistically different shares of minority employment in the high-tech industries (Figure 5).
- The United States (15.9%, ±0.3%, with a range from 15.6% to 16.2%) had a statistically significant share of minority participation in high-tech industries that was larger than Northeast Ohio and the state of Ohio.

Figure 6. Percentage of Employment Estimates by Minority and Non-Minority Workers for Selected Non High-Tech Industries in NEO, Ohio, and the U.S., 2010



Source: American Community Survey Public Use Micro Data

- Northeast Ohio (10.5%, ±1.9%)[16] and the state of Ohio (9.0%, ±1.4%)[17] did not have statistically different shares of minority employment in the non-high-tech industries (Figure 6).
- The United States (20.9%, ±0.4%) had a statistically significant share of minority participation in non-high-tech industries that was larger than Northeast Ohio and the state of Ohio.

[14] This percentage can range from 7.5% to 11.3%.
[15] This percentage can range from 6.3% to 8.7%.
[16] This percentage can range from 8.6% to 12.4%.
[17] The actual percentage can range from 7.6% to 10.4%.

Table 9. Northeast Ohio Employment by Class of Worker and Type of Industry, 2010

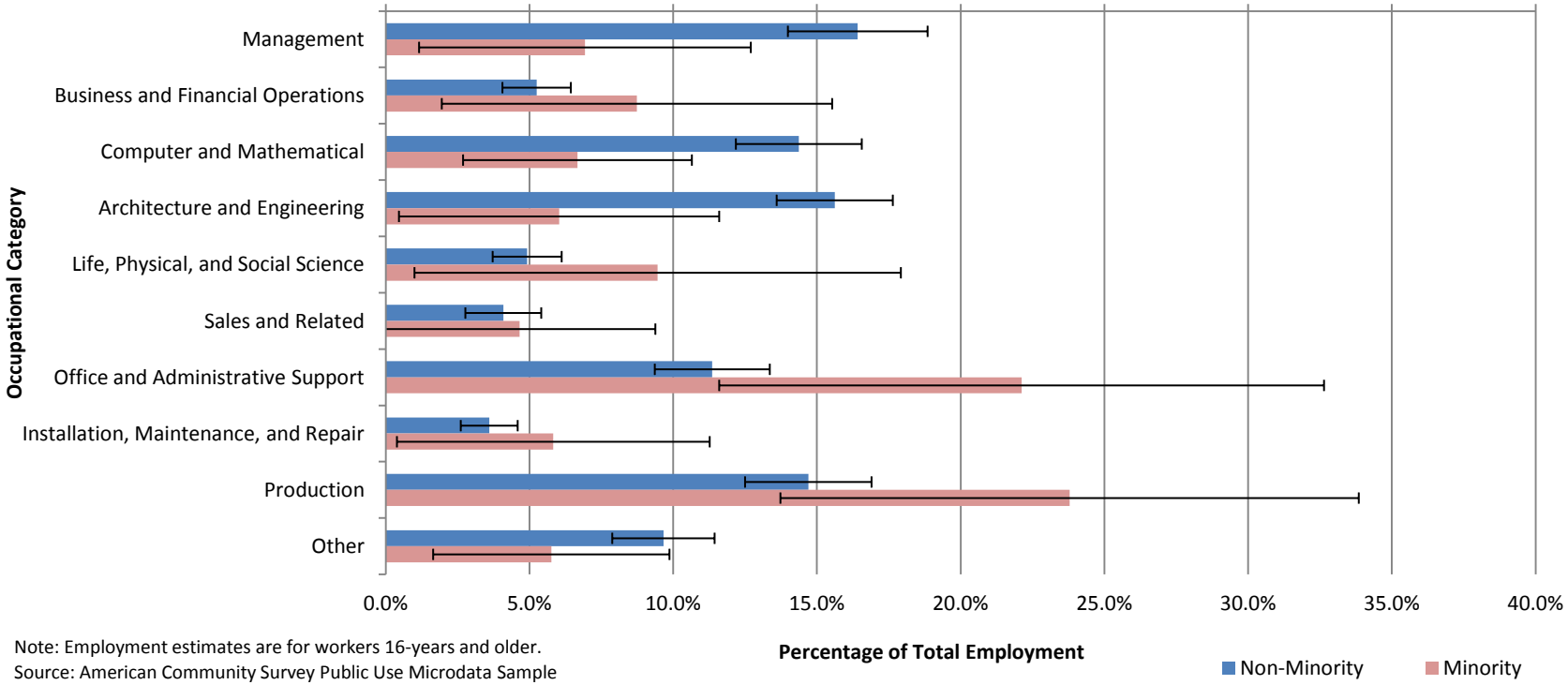
	2010 Employment Count	2010 Estimate MOE	2010 Percent of Total	2010 Percent MOE
High-Tech				
Minority				
Self-employed	148	182	1.7%	2.0%
Works for wages	8,685	2,032	98.3%	2.0%
Non-Minority				
Self-employed	5,150	1,367	6.0%	1.5%
Works for wages	80,303	5,361	94.0%	1.5%
Non-High-Tech				
Minority				
Self-employed	93	155	0.8%	1.3%
Works for wages	12,150	2,271	99.2%	1.3%
Non-Minority				
Self-employed	3,321	897	3.2%	0.9%
Works for wages	101,176	6,378	96.8%	0.9%
All Other Industries				
Minority				
Self-employed	12,438	2,176	5.2%	0.9%
Works for wages	225,326	7,513	94.8%	0.9%
Non-Minority				
Self-employed	114,214	6,152	9.2%	0.5%
Works for wages	1,127,564	14,470	90.8%	0.5%

Note: Employment estimates are for workers 16-years and older.
Source: American Community Survey Public Use Microdata Sample

- Table 9 displays the class of worker (self-employed versus works for wages) for the Northeast Ohio region by industry type (high-tech, non-high-tech, and all other) and race (minority and non-minority).
- In the high-tech industries, self-employed minorities accounted for 1.7% (±2.0%) of 8,833 minority workers. This was much lower than the percent of non-minorities who were self-employed 6.0% (±1.5%).
- In the non-high-tech industries, only 0.8% (±1.3) of minorities were self-employed in comparison to 3.2% (±0.9%) of non-minorities.
- In all three types of industries, the percent of minorities who were self-employed was smaller than the percent of non-minorities who were self-employed.

Occupation Estimates

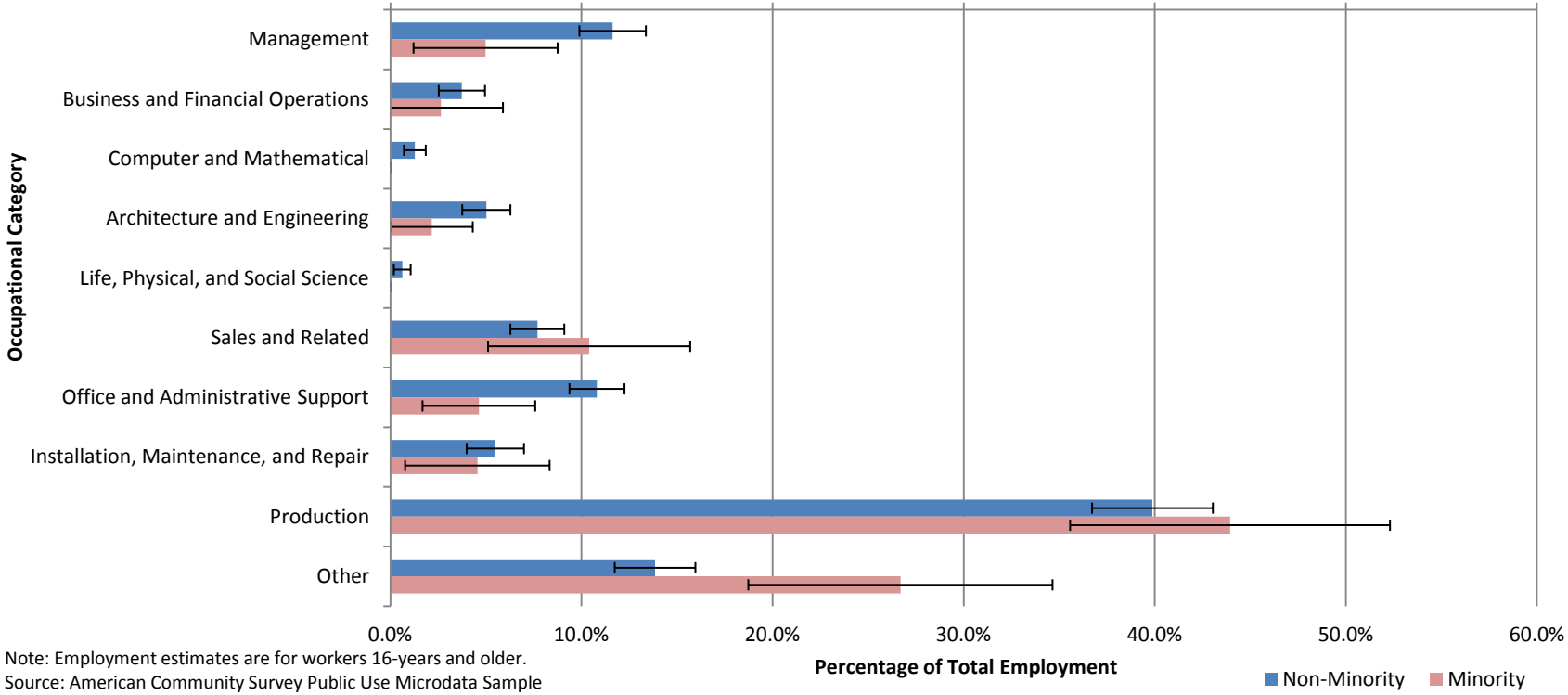
Figure 7. Major Occupations in the High-Tech Sector in Northeast Ohio for Minority and Non-Minority Groups, 2010



Note: Employment estimates are for workers 16-years and older.
Source: American Community Survey Public Use Microdata Sample

- Figure 7 displays the percentage of non-minority and minority workers by major occupations for high-tech industries in Northeast Ohio.
- Management occupations accounted for 16.4% (±2.4%) of non-minority workers in Northeast Ohio's high-tech industries, but only 6.9% (±5.8%) of minority workers (612, ±514). This is a statistically significant difference.
- This lower participation percentage of minorities was similar for math and science occupations; minorities accounted for only 22.2% of all employees in these occupations while non-minorities accounted for 34.9% (not shown in Figure). In 2010, there were 1,958 (±1,023) minorities in math and science occupations in Northeast Ohio.
- Three occupational categories featured statistically significant differences between minority and non-minority shares of employment: Management; Computer and Mathematical; and Architecture and Engineering.

Figure 8. Major Occupations in the Non-High-Tech Sector in Northeast Ohio for Minority and Non-Minority Groups, 2010

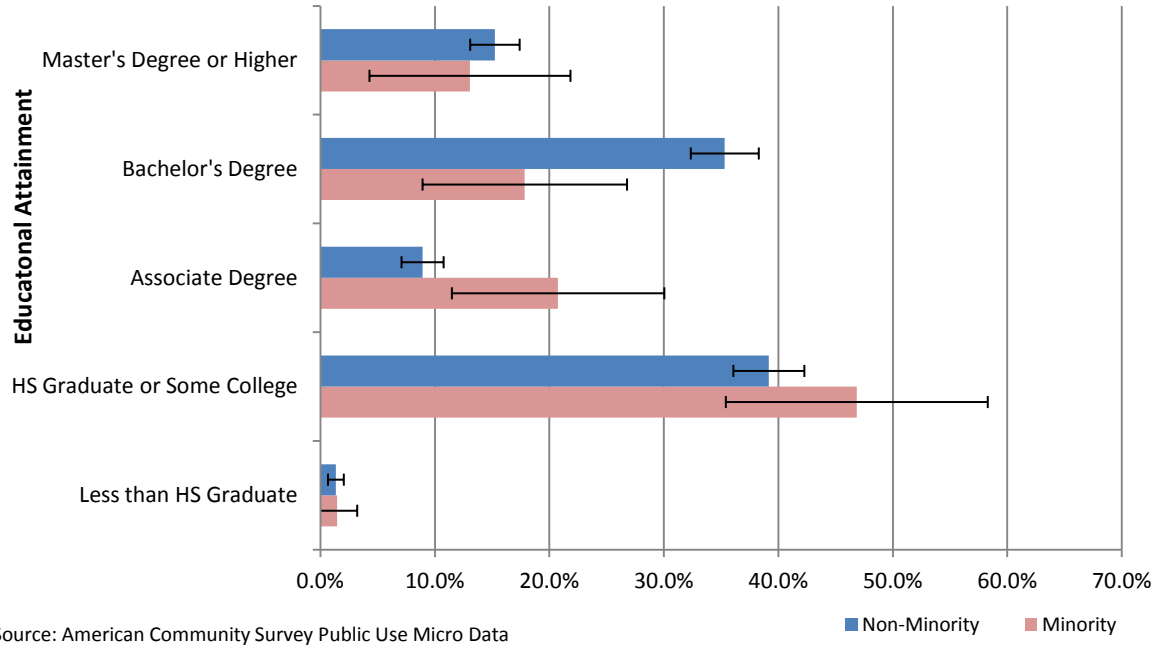


Note: Employment estimates are for workers 16-years and older.
Source: American Community Survey Public Use Microdata Sample

- Figure 8 illustrates the percentage of major occupations in Northeast Ohio's non-high-tech industries for minority and non-minority employees.
- Only 5.0% (±3.8%) of minorities were in management occupations in 2010. Further, only 2.2% of minorities (±2.2%) were in math and science occupations. As was the case with the high-tech industries, non-minorities in non-high-tech industries had a higher percentage of employees in management occupations (11.6%, ±1.7%) as compared to minority workers.
- Two occupational categories had statistically significant differences between minority and non-minority percentages of participation: Management; and Office and Administrative Support.

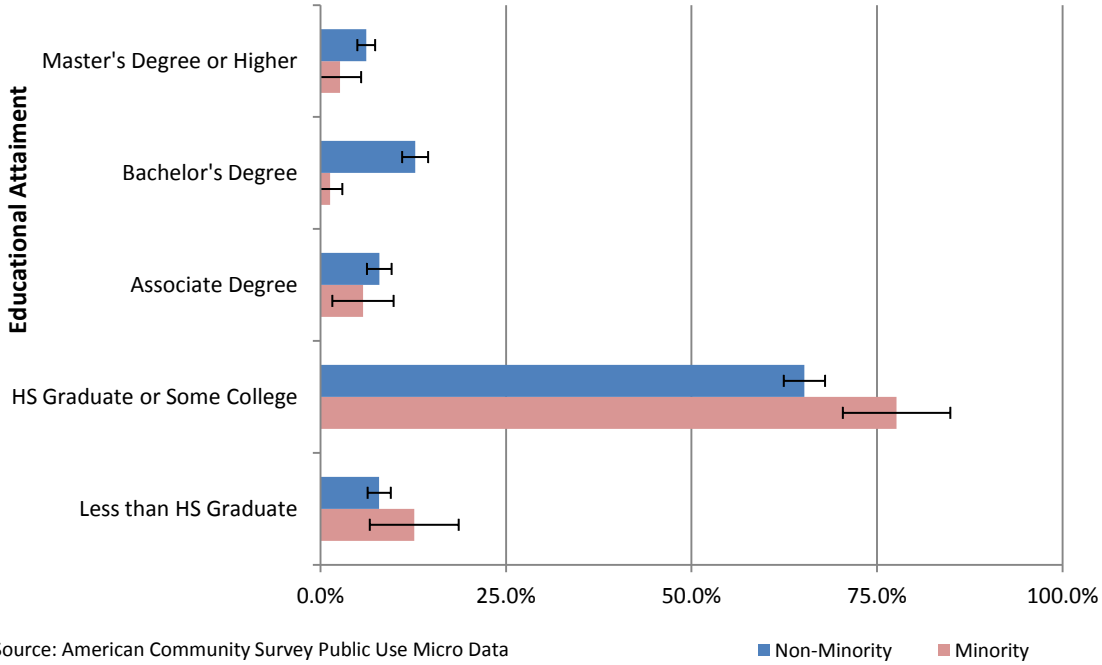
Educational Attainment Estimates

Figure 9. Educational Attainment by Minority Status in the High-Tech Industries, 2010



Source: American Community Survey Public Use Micro Data

Figure 10. Educational Attainment by Minority Status in the Non-High-Tech Industries, 2010



Source: American Community Survey Public Use Micro Data

- Educational attainment by minority status in high-tech industries revealed that a higher, statistically significant percentage of minorities had associate degrees (20.8%) in comparison to non-minorities (8.9%) (Figure 9).

- Educational attainment by minority status in non-high-tech industries revealed that, compared to non-minorities, a higher, statistically significant percentage of minorities graduated from high school or had some college, but had a lower percentage of bachelor's degree attainment (Figure 10).

- Of all minorities working in high-tech industries, 30.9% or 2,731 (±1,657) had bachelor's degrees or higher. Of all minorities working in non-high-tech industries, only 4.0% or 487 (±554) had at least a bachelor's degree. This may suggest that minorities with bachelor's degrees or higher tend to work more often in high-tech industries.

- For non-minorities employees, 50.6% or 43,201 (±5,323) of those working in high-tech industries had bachelor's degrees or higher, while only 18.9% or 19,783 (±3,179) of non-minorities working in non-high-tech industries had bachelor's degrees or higher.

- For more information on educational attainment in Northeast Ohio by minority status, see Appendix Table A. 8. Workforce Educational Attainment in Northeast Ohio by Minority Status, 2010.

CHAPTER 3: MINORITY BUSINESS OWNERSHIP

This report was prepared for PolicyBridge and NorTech by the Center for Economic Development at the Levin College of Urban Affairs at Cleveland State University. The study analyzes minority participation in technology-based growth clusters using secondary data sources. Minority participation in technology-based growth clusters is an overall framework that can be divided into two components: high-tech industries and non-high-tech industries.[18] This study complements research conducted by PolicyBridge that is primarily based on interviews and focus groups; it assists these organizations in drafting policy recommendations on how to increase in the role of minorities in high-tech and non-high-tech industries.

This analysis uses several measures to estimate minority business ownership, including number of firms, employment, payroll, and business receipts for employers and non-employers in the 11-county[19] Northeast Ohio region. The analysis is based on data from the U.S. Census Bureau's Survey of Business Owners (SBO) dataset for 2007, which was purchased and tabulated especially for this study. In order to create a benchmarking system, we compared the Northeast Ohio region, the state of Ohio, and the United States. The SBO data is tabulated by firms in two classifications: employers and non-employers; employers are firms that employ others in their business activities while non-employers are mostly self-employed individuals operating unincorporated businesses.[20] For the purposes of this study, we only analyzed African-American and Hispanic business ownership; the term "minority" refers only to these two groups. In this report, graphics and tables are displayed, followed by bullet points highlighting the observations of data collected and studied.

MAJOR FINDINGS

Overall, African-American and Hispanic employer ownership in technology-based growth industries accounted for a small percentage of total ownership of all races/ethnicities in these industries. In Northeast Ohio, African-American ownership accounted for 1.04% (± 0.49%, with a range of 0.55% to 1.53%) of total ownership in technology-based growth industries, while the state of Ohio reported 0.96% (± 0.26%, with a range of 0.70% to 1.22%) and the United States reported 1.15%. Due to the error rates on these measures, no statistical difference existed between Northeast Ohio, Ohio, and the United States for African-American ownership in technology-based growth industries.

The share of Hispanic business ownership in technology-based growth industries in the United States was much higher than the share in Northeast Ohio and Ohio. Hispanic business ownership in technology-based growth industries in Northeast Ohio accounted for 0.74% (± 0.46%, with a range of 0.28% to 1.20%) of all technology-based industry employers in comparison to 0.60% (± 0.23%, with a range of 0.37% to 0.83%) in the state of Ohio and 3.03% in the United States. Taking into consideration the error rates of Hispanic business ownership in technology-based growth industries, a statistically lower share of Hispanic business ownership exists in Northeast Ohio and Ohio in comparison to the United States.

[18] For more information on high-tech and non-high-tech operational definition, see the Methodology section of this report.
[19] The Northeast Ohio region is defined for this study as the 11-county region that includes Ashtabula, Cuyahoga, Geauga, Lake, Lorain, Mahoning, Medina, Portage, Stark, Summit, and Trumbull counties. These counties were selected because at least 5% of their residents are minorities. Other Northeast Ohio counties whose minority population accounted for less than 5% were excluded from this study.
[20] For more information on non-employers, see http://www.census.gov/econ/nonemployer/

Examining minority ownership in the **high-tech industries'** component of technology-based growth industries revealed interesting details about this sphere in Northeast Ohio. In regards to African-American-owned businesses in high-tech industries, Northeast Ohio (0.8%, ±0.4%, with a range from 0.4% to 1.2%), the state of Ohio (1.1%, ±0.4%, with a range from 0.7% and 1.5%), and the United States (1.5%) did not have statistically different shares. Alternatively, Hispanic employers in the high-tech sector showed that both Northeast Ohio (1.4%, ±1.1%, with a range from 0.3% and 2.5%) and the state of Ohio (1.1%, ±0.6%, with a range from 0.5% and 1.7%) had statistically lower shares of ownership than the United States (3.1%).

When comparing Northeast Ohio to the state of Ohio and the United States, it is important to take into consideration the minority share of the population aged 18-years and above that resides within each geographic area. In short, if a locality does not have a large minority population, then it cannot have a high participation rate in business ownership. In order to evaluate this comparison, the employer ownership share of shares calculates minority employer ownership rates in relation to the size of the minority population in a geographic region. If this measure equals one, the minority employer ownership rate equals the relative size of the minority population in that geography. For **high-tech employers**, African-Americans in Northeast Ohio reported a share of shares of 0.06 (±0.03, with a range from 0.03 to 0.09), which indicates a very low number of African-American business owners in high-tech industries in proportion to their share of the Northeast Ohio population. For Hispanics in Northeast Ohio, the share of shares was 0.56 (±0.44, with a range from 0.12 to 1.00). The state of Ohio reported a higher share of shares for both demographic groups (Hispanics - 0.50, ±0.27, with a range from 0.23 to 0.77; African-Americans - 0.10 ±0.04, with a range from 0.06 to 0.14) as did the United States (Hispanics – 0.24; African-Americans – 0.13). Data for **non-high-tech employers** in Northeast Ohio were suppressed so analysis was not possible, but Hispanics in the state of Ohio reported a share of shares of 0.14 (±0.07, with a range from 0.07 to 0.21) while African-Americans reported 0.08 (±0.04, with a range from 0.04 to 0.12). The United States reported 0.22 for Hispanics and 0.14 for African-Americans in non-high-tech industries, which suggests slightly higher national shares of shares in comparison to Ohio.

In general, African-American and Hispanic employer ownership in technology-based growth industries was a small piece of ownership by all races/ethnicities in technology based-growth industries. It is important, however, to foster and grow these sectors, as they are economic drivers of the regional economy. Data show that African-Americans and Hispanics in Northeast Ohio are fairly well represented as non-employer owners in technology-based growth industries, but these businesses do not facilitate job growth because they do not have employees. These findings suggest that new policies are needed to train and incentivize African-Americans and Hispanics to open businesses in these industries that employ others. Such businesses can help to foster economic development, growth, and prosperity in Northeast Ohio.

METHODOLOGY

For this analysis, data were gathered from the U.S. Census Bureau's Survey of Business Owners (SBO) dataset for 2007. As the data necessary for this report are not publicly available, special tabulations were ordered from the U.S. Census Bureau for the 11-County Northeast Ohio region for all industries as well as selected high-tech and non-high-tech industries. All data points from the SBO database are self-reported (including industry classification and racial and ethnic designation). This report uses the SBO data to analyze minority participation in business ownership in technology-based growth industries.

It is important to note that the U.S. Census Bureau has different designations for racial and ethnic groups. Each individual counted by the U.S. Census Bureau receives a mark under a racial designation and a mark under ethic designation, meaning an individual can have both a race and an ethnicity. Under these guidelines, classification as an African-American is considered a racial group while classification as a Hispanic is considered an ethnic group. Double counting may be prevalent in this data for individuals who self-identified as both African-American and Hispanic.[21]

Since SBO data are generated from a survey, error rates are provided to show the variability of the estimates. The error rates are used to estimate the range of possible values in which an estimate can lie, via low and high values (as marked as ±). In a hypothetical example, if the estimate is listed as 250 employees ±25, the actual value lies within a range of values from 225 (250-25) to 275 (225+25). This can be applied to percentages as well. On average, the error rates will be larger for smaller geographies than larger geographies; therefore, the error rates for Northeast Ohio will be larger than those of the state of Ohio. Error rates were not calculated for the United States since the sample size for the SBO is largest for the United States. When examining minority participation rates across geographic regions, it is important to remember the error rates. If the error rates do not overlap between different categories then the percentages are statistically different and the comparison is valid. In the report, this occurrence can be seen in bar charts that feature error bars.

In addition, since the U.S. Census Bureau maintains confidentiality of SBO respondents, at times data will not be given, but rather marked with an "S". This "S" denotes that suppression has occurred, and that the U.S. Census Bureau did not release that piece of data because of confidentiality restrictions.

The data for the examination of minority participation in technology-based growth clusters were derived from establishments classified at the 6-digit level by the North American Industry Classification System (NAICS). This represents the finest level of industry detail achievable in the NAICS database. The Center for Economic Development, in conjunction with NorTech and other Northeast Ohio economic development intermediaries, identified NAICS codes for the following clusters: (1) Bioscience; (2) Instruments, Control, and Electronics; (3) Power and Propulsion; (4) Advanced Materials; and (5)Advanced/Alternative Energy.

Following the identification of NAICS codes in these five clusters, it was determined that, due to disclosure limitations, reporting issues, and measurement error of databases used for this project, data for these clusters would be aggregated to a cluster-level designation of either selected high-tech,[22]

[21] For more information, see http://www.census.gov/econ/sbo/faq.html
[22] For a listing of industries selected as high-tech, see Appendix A.6.

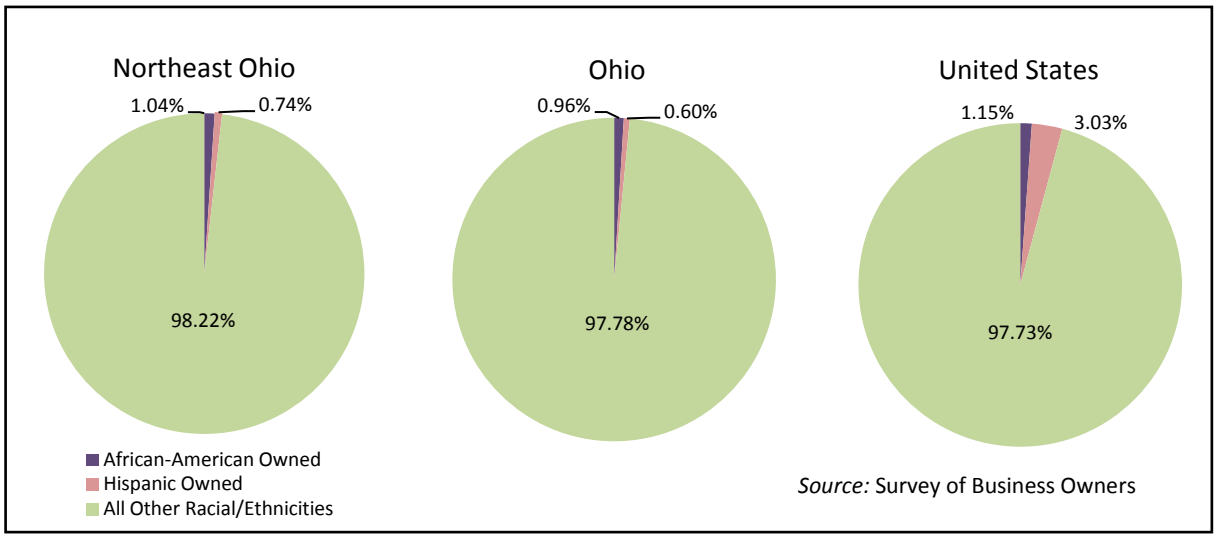
selected non-high-tech,[23] or all industries. The selected high-tech industries were chosen from the Northeast Ohio High-Technology Economy Report prepared for NorTech,[24] and the selected non-high-tech industries were the remainder of cluster industries not identified as high-tech industries in that report. The all industries classification designates the total from all industries within the NAICS system.

[23] For a listing of industries selected as non-high-tech, see Appendix A.7.
[24] Iryna Lendel, Ph.D. and Sunjoo Park, "Northeast Ohio High-Technology Economy Report" February 10, 2011

ANALYSIS OF MINORITY BUSINESS OWNERSHIP

EMPLOYERS

Figure 11. Employer Ownership by Race/Ethnicity of Technology-Based Growth Industries, 2007



- Figure 11 examines African-American and Hispanic ownership as a percentage of all firms, regardless of minority or ethnic status in technology-based growth industries.[25] This figure does not take into consideration error rates.
- The figure above paints a salient picture that, overall, African-American and Hispanic business ownership in technology-based growth industries, regardless of geography, is a very small percentage of overall employer ownership rates in these industries.
- In Northeast Ohio, African-American ownership accounted for 1.04% (± 0.49%, with a range of 0.55% to 1.53%) of all ownership in technology-based growth industries. African-Americans accounted for 0.96% (± 0.26%, with a range of 0.70% to 1.22%) of all ownership in technology-based growth industries in the state of Ohio and 1.15% in the United States.
- Hispanic business ownership accounted for 0.74% (± 0.46%, with a range of 0.28% to 1.20%) of total ownership in these industries in Northeast Ohio, 0.60% (± 0.23%, with a range of 0.37% to 0.83%) in the state of Ohio, and 3.03% in the United States.

[25] The summation of high-tech and non-high-tech industries.

Table 10. Minority Employers in Northeast Ohio, 2007

	Northeast Ohio Employers (11-County)							
	Firms		Receipts ($Thousands)		Employment		Payroll ($Thousands)	
	Count	Error ±	Count	Error ±	Count	Error ±	Count	Error ±
High-Tech								
African-American Owned	27	14	$30,159	$9,168	186	65	$11,978	2,875
Hispanic Owned	47	37	$33,847	$10,289	99	65	$7,001	6,833
All Firms	3,258	313	$6,004,819	$1,056,848	33,181	3,716	$1,733,692	194,174
Non-High-Tech								
African-American Owned	S	S	S	S	S	S	S	S
Hispanic Owned	S	S	S	S	S	S	S	S
All Firms	4,744	531	$19,232,878	$1,846,356	83,307	10,663	$3,269,479	$470,805
All Industries								
African-American Owned	1,140	128	$1,440,214	$253,478	13,825	2,654	$313,881	$55,243
Hispanic Owned	472	53	$889,635	$113,873	4,240	407	$148,705	$21,414
All Firms	64,101	1,026	$123,891,954	$5,946,814	776,821	37,287	$24,565,087	$786,083

Note: S denotes a suppression.
Source: U.S. Census Bureau, Survey of Business Owners

- In 2007, 27 high-tech firms (±14) in Northeast Ohio were owned by African-Americans (Table 10). This statistic suggests that the actual number of selected high-tech firms owned by African-Americans in Northeast Ohio could be between 13 and 41. Total employment for African-American-owned firms was 186 (±65), signifying total employment could range from 121 employees to 251 employees.

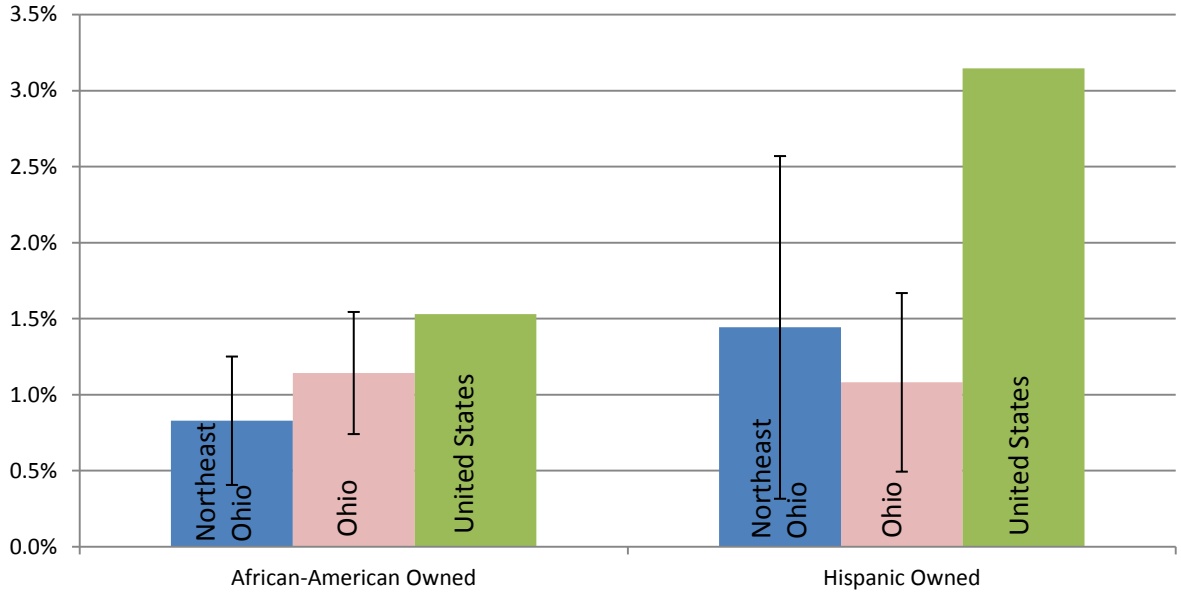
- It was reported that 47 (±37) Hispanic-owned high-tech firms existed in Northeast Ohio, which indicates that the actual count could range from 10 to 84. Total employment of Hispanic-owned high-tech firms was 99 (±65) in 2007, a ranging of 34 to 164.

- African-American and Hispanic counts for non-high-tech industries were suppressed by the U.S. Census Bureau for unknown confidentiality reasons. These data are marked in Table 10 with an "S".

- It is interesting to note that minority participation was higher for all industries. Within this category, there are 1,140 African-American firms (±128, a range of 1,012 to 1,268) and 472 Hispanic firms (±53, a range of 419 to 525).

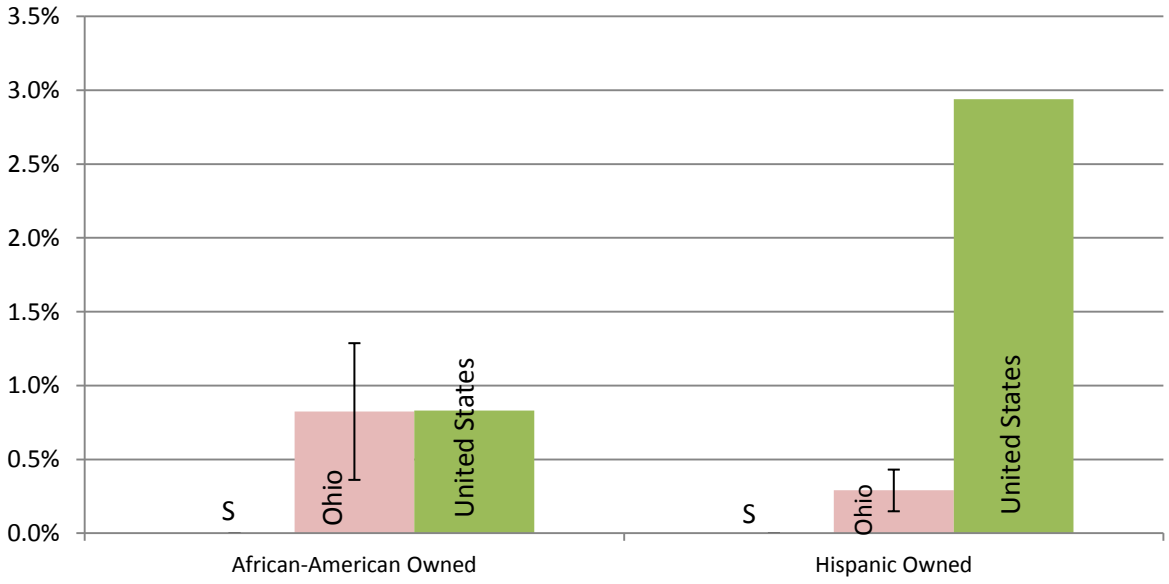
- For more information on minority employers in Ohio and the United States, see:
    - Appendix Table A.9. Minority Employers in the state of Ohio for High-Tech, Non-High-Tech and All Industries, 2007
    - Appendix Table A.10. Minority Employers in the United States for High-Tech, Non-High-Tech and All Industries, 2007

Figure 12. Percentage of Employer Firms by African-American and Hispanic Owners for Selected High-Tech Industries in NEO, Ohio, and the U.S., 2007



Source: U.S. Census Bureau, Survey of Business Owners

Figure 13. Percentage of Employer Firms by African-American and Hispanic Owners for Selected Non-High-Tech Industries in NEO, Ohio, and the U.S., 2007



Note: S dentoes a suppression
Source: U.S. Census Bureau, Survey of Business Owners

- Figures 12 and 13 examine the percentage of African-American- and Hispanic-owned employer, high-tech firms in Northeast Ohio, Ohio, and the United States.

- Northeast Ohio and Ohio do not have statistically different percentages of African-American-owned businesses in high-tech industries (Figure 12). The share in Northeast Ohio ranges from 0.4% to 1.2% (share of 0.8%) and overlaps with Ohio's share that ranges from 0.7% and 1.5% (value of 1.1%). However, the share in the nation (1.5%) is statistically higher than that in Northeast Ohio.

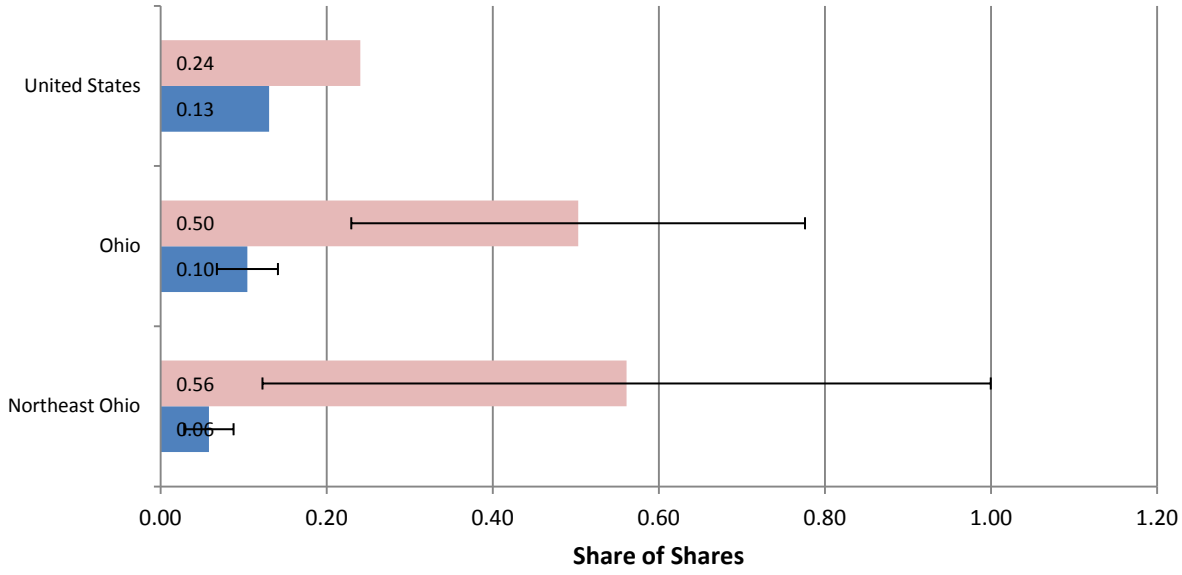
- Northeast Ohio (1.4%, ±1.1%, with a range from 0.3% to 2.5%) did not have a statistically different share of the percentage of Hispanic-owned businesses in high-tech industries when compared to the state of Ohio (1.1%, ±0.6%, with a range from 0.5% and 1.7%). However, both Northeast Ohio and the state of Ohio were statistically lower than the United States (3.1%) (Figure 12).

- For non-high-tech industries, Northeast Ohio data were suppressed and could not be evaluated (Figure 13). These data were marked with an "S".

- The state of Ohio (0.8%, ±0.5%, with a range from 0.3% and 1.3%) and the United States (0.8%) did not have statistically different shares of the percentage of African-American-owned businesses in non-high-tech industries (Figure 13).

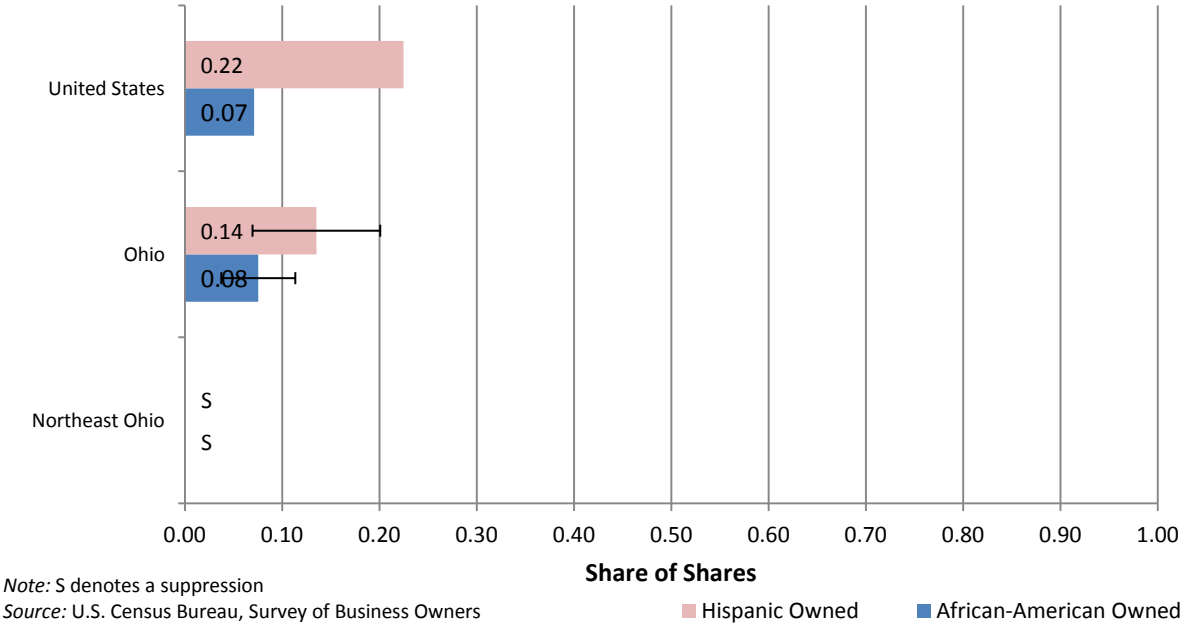
- In regards to Hispanic-owned businesses, the state of Ohio (0.3%, ±0.1%, with a range from 0.2% and 0.4%) had a statistically lower percentage of Hispanic-owned businesses in non-high-tech industries when compared to the United States (2.9%) (Figure 13).

Figure 14. Share of Shares of Employer Firms by African-American and Hispanic Owners for Selected High-Tech Industries in NEO, Ohio, and the U.S., 2007



Source: U.S. Census Bureau, Survey of Business Owners

Figure 15. Share of Shares of Employer Firms by African-American and Hispanic Owners for Selected Non-High-Tech Industries in NEO, Ohio, and the U.S., 2007



Note: S denotes a suppression
Source: U.S. Census Bureau, Survey of Business Owners

- Figures 14 and 15 present minority employer ownership as a percentage of the population by racial/ethnic group in Northeast Ohio, the state of Ohio, and the United States. The share of shares compares the percent of minority employer ownership by racial/ethnic group[26] to the percentage of that racial/ethnic group in the total population over the age of 18.[27] If the share of shares equals one, then the share of minority employer ownership in a racial/ethnic group is equal to the proportion of that group in the respective population.

- The share of shares for Hispanic employer, high-tech firms was statistically larger than that of African-American employer, high-tech firms in all three geographies. Examining the share of shares for Hispanics, however, shows that significant error rates are associated with these shares and should be taken into consideration when evaluating these estimates.

    - For high-tech employers, Hispanics in Northeast Ohio reported a share of shares of 0.56 (±0.44, with a range from 0.12 to 1.00) while African-Americans reported 0.06 (±0.03, with a range from 0.03 to 0.09) (Figure 14).
    - In the state of Ohio, the share of shares for Hispanics was 0.50 (±0.27, with a range from 0.23 to 0.77) while the share was 0.10 for African-Americans (±0.04, with a range from 0.06 to 0.14).

- No statistical difference existed among Hispanic and African-American high-tech, employer firms across the three geographies (Northeast Ohio, the state of Ohio, and the United States) (Figure 14).

- Since data for non-high-tech industries in Northeast Ohio were suppressed, it was not possible to calculate a share of shares ratio for this geography. Therefore, these data were marked with an "S" in Figure 15.

- Hispanics in the state of Ohio reported a slightly lower statistical share of shares for non-high-tech industries than in the United States. In Northeast Ohio, Hispanics had a share of shares of 0.14 (±0.07, with a range from 0.07 to 0.21), compared to 0.22 in the United States.

- No statistical difference exists between Ohio and the share of shares in the United States for African-Americans ownership in non-high-tech industries. Ohio reported a share of shares of 0.08 (±0.04, with a range from 0.04 to 0.12), compared to 0.07 in the U.S. (Figure 15).

[26] Source: Survey of Business Owners
[27] Source: American Community Survey, 5 year annual estimates, 2005-2009

NON-EMPLOYERS

Non-employers are mostly self-employed individuals without employees in their business venture. It is not known if these individuals are full- or part-time workers, only that they have non-employer status. This tabulation was created specially by the U.S. Census Bureau for this report.

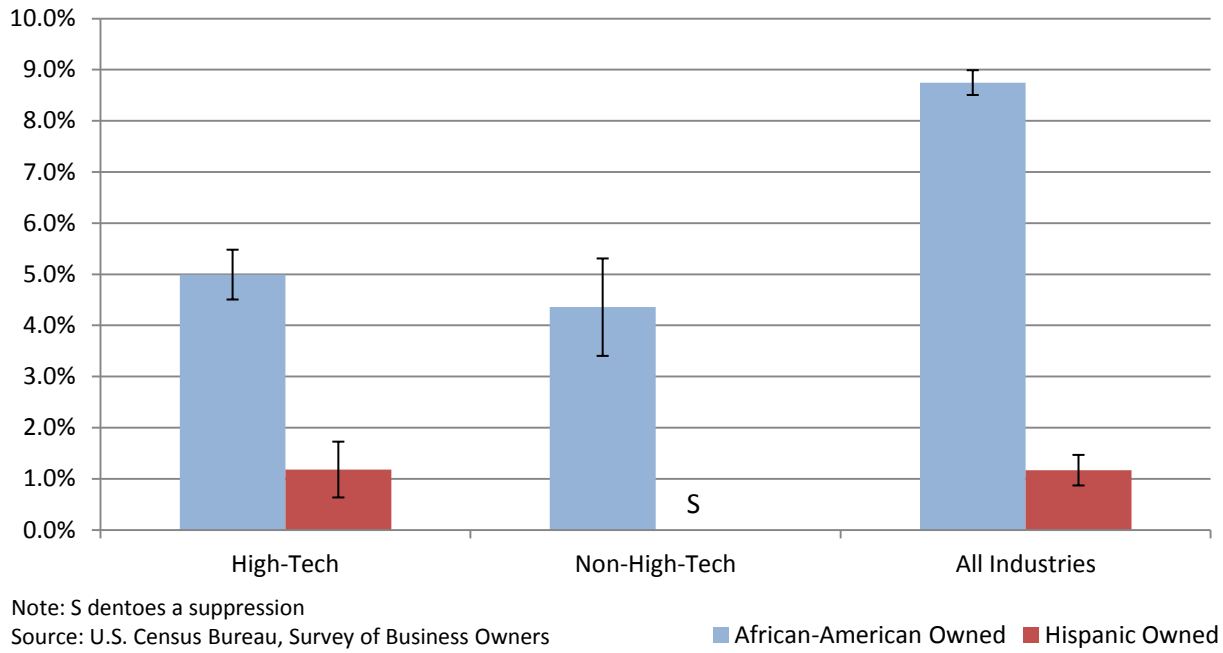
Table 11. Minority Non-Employers in Northeast Ohio, 2007

	Northeast Ohio Employers (11-County)			
	Firms		Receipts ($Thousands)	
	Count	Error ±	Count	Error ±
High-Tech				
African-American Owned	1,738	389	$31,446	$14,591
Hispanic Owned	411	191	$18,108	$11,010
All Firms	34,809	1,671	$1,243,895	$179,121
Non-High-Tech				
African-American Owned	2,233	500	$46,659	$20,157
Hispanic Owned	S	S	S	S
All Firms	51,259	2,460	$2,286,528	$365,844
All Industries				
African-American Owned	20,140	644	$380,822	$36,559
Hispanic Owned	2,690	689	$110,848	$63,848
All Firms	230,225	3,684	$9,675,540	$619,235

Note: S denotes a suppression
Source: U.S. Census Bureau, Survey of Business Owners

- The African-American and Hispanic communities in Northeast Ohio accounted for a larger portion of total non-employer firms (Table 11) than they did of employer firms (Table 10).
- Of high-tech non-employers in 2007, there were 1,738 (±389) firms owned by African-Americans. This suggests that the number of non-employer, high-tech firms owned by African-Americans in Northeast Ohio could be between 1,349 and 2,127. In regards to Hispanics, 411 (±191) Hispanic-owned, non-employer, high-tech firms were reported in the region, indicating this count could range from 220 to 602 (Table 11).
- The estimate of African-American non-employers in non-high-tech industries was 2,233 (±500, a range of 1,733 to 2,733). The Hispanic counts for non-employer, non-high-tech industries were suppressed by the U.S. Census Bureau for confidentiality reasons and were marked in Table 2 with an "S".
- Minority participation was considerably higher for all industries. Within this category, there are 20,140 African-American firms (±644, a range of 19,496 to 20,784) and 2,690 Hispanic firms (±689, a range of 2,001 to 3,379).

Figure 16. Percentage of African-American and Hispanic Non-Employer Firms in Northeast Ohio, 2007



Note: S dentoes a suppression
Source: U.S. Census Bureau, Survey of Business Owners

- Figure 16 examines the percentage of African-American- and Hispanic-owned, non-employer firms in Northeast Ohio in 2007. Hispanic counts for non-employer, non-high-tech industries were suppressed and marked in Figure 16 with an "S".

- In Northeast Ohio, African-American, high-tech non-employers (5.0%, ±0.5%, with a range from 4.5% to 5.5%) had statistically higher share of ownership than Hispanic, high-tech non-employers (1.2%, ±0.5%, with a range from 0.7% to 1.7%)

- In addition, African-American non-employers in all industries (8.7%, ±0.2%, with a range from 8.5% to 8.9%) showed a statistically higher share of ownership than Hispanic non-employers in all industries (1.2%, ±0.3%, with a range from 0.9% to 1.5%).

- Examining the percentage for African-Americans in non-employer firms indicates that no statistical difference exists between the percentages in the growth clusters' high-tech and non-high-tech industries. However, the percentage of African-Americans in all industries is much higher statistically than in both the high-tech and non-high-tech growth cluster industries.

APPENDIX TABLES A.1. – A.10.

A. 1. Listing of STEM Academic Disciplines

STEM Academic Disciplines
Aerospace Engineering
Agricultural Sciences
Architecture and Environmental Design
Astronomy
Biological Sciences
Chemical Engineering
Chemistry
Civil Engineering
Computer Science
Earth Sciences
Electrical Engineering
Engineering Technologies
Health Technologies
History of Science
Industrial Engineering
Interdisciplinary or Other Sciences
Materials Engineering
Mathematics and Statistics
Mathematics Education
Mechanical Engineering
Medical Sciences
Other Engineering
Other Life Sciences
Other Science/Technical Education
Physics
Science Education
Science Technologies

Source: National Science Foundation

A. 2. List of 2- and 4- Year Institutions and Number of STEM Degrees Awarded to Minorities in Northeast Ohio, 2009

Academic Institution	Number of STEM degrees awarded	Academic Institution	Number of STEM degrees awarded
Boheckers Business College	1	Lake Erie College	2
Baldwin-Wallace College	4	Lakeland Community College	17
Bryant & Stratton College	34	Lorain County Community College	36
Case Western Reserve University	72	Malone College	7
Cleveland Institute of Art	-	Mount Union College	1
Cleveland Institute of Electronics	8	Northeastern Ohio Universities College of Med	9
Cleveland State University	63	Notre Dame College (Cleveland, OH)	1
Cuyahoga Community College	112	Ohio College of Podiatric Medicine	16
David N. Myers College	1	Oberlin College	11
ETI Technical College of Niles	11	Stark State College of Theology	29
Hiram College	4	University of Akron, All Campuses	94
ITT Technical Institute (Youngstown, OH)	17	Ursuline College	34
John Carroll University	5	Walsh University	6
Kent State University, All Campuses	77	Youngstown State University	68
		Total Number of Degrees Awarded	**740**

Source: National Science Foundation

A. 3. STEM Percentage by Degree Type for Each Ethic/Racial Group, 2009

		Northeast Ohio	Ohio	United States
	Ethic/Racial Group	STEM Percentage of Higher Education Degrees	STEM Percentage of Higher Education Degrees	STEM Percentage of Higher Education Degrees
Associate's Degree	African-Americans	29.7%	37.8%	28.4%
	Asians	47.9%	47.6%	31.8%
	Hispanics	39.7%	40.1%	22.3%
	Whites	47.8%	48.9%	32.3%
Bachelor's Degree	African-Americans	21.4%	19.8%	21.9%
	Asians	51.1%	42.2%	37.6%
	Hispanics	26.7%	22.5%	20.7%
	Whites	29.0%	27.1%	25.9%
First Professional Degree	African-Americans	41.9%	45.5%	43.5%
	Asians	72.4%	75.9%	68.0%
	Hispanics	66.7%	44.4%	40.6%
	Whites	39.4%	47.7%	44.6%
Master's Degree	African-Americans	13.2%	12.7%	16.2%
	Asians	37.0%	28.4%	33.4%
	Hispanics	12.8%	12.6%	17.4%
	Whites	20.4%	19.5%	21.6%
Post-Master's Certificate	African-Americans	12.5%	25.0%	6.4%
	Asians	100.0%	66.7%	48.1%
	Hispanics	0.0%	0.0%	16.3%
	Whites	31.3%	29.6%	13.5%
Doctorate Degree	African-Americans	50.0%	20.2%	29.4%
	Asians	68.8%	73.3%	63.1%
	Hispanics	63.6%	44.7%	41.9%
	Whites	59.9%	47.2%	50.6%
Doctorate Degree-Professional Practice	African-Americans	100.0%	48.9%	43.9%
	Asians	100.0%	82.6%	68.8%
	Hispanics	100.0%	50.0%	42.8%
	Whites	95.1%	68.8%	51.4%

Source: National Science Foundation

A. 4. Share of STEM Degrees Awarded to Whites of All Degrees Awarded to Whites, 2009

	Northeast Ohio (11- County)			Ohio			United States		
Level of STEM Degrees	Degrees in All Disciplines Awarded to Whites	STEM Degrees Awarded to Whites	% of Whites Degrees in STEM	Degrees in All Disciplines Awarded to Whites	STEM Degrees Awarded to Whites	% of Whites Degrees in STEM	Degrees in All Disciplines Awarded to Whites	STEM Degrees Awarded to Whites	% of Whites Degrees in STEM
Associate's Degree	5,222	2,498	47.8%	19,032	9,313	48.9%	446,617	144,352	32.3%
Bachelor's Degree	11,900	3,456	29.0%	48,828	13,235	27.1%	1,047,635	270,797	25.9%
First Professional Degree	670	264	39.4%	1,441	687	47.7%	31,678	14,118	44.6%
Master's Degree	4,122	841	20.4%	15,455	3,010	19.5%	365,343	78,957	21.6%
Post-Master's Certificate	48	15	31.3%	125	37	29.6%	11,171	1,502	13.5%
Doctorate Degree	312	187	59.9%	1,159	547	47.2%	31,437	15,898	50.6%
Doctorate Degree-Professional Practice	61	58	95.1%	1,245	857	68.8%	28,809	14,809	51.4%
Total Number of Degrees Awarded	**22,335**	**7,319**	**32.8%**	**87,285**	**27,686**	**31.7%**	**1,962,690**	**540,433**	**27.5%**

Source: National Science Foundation

A. 5. Share of STEM Degrees Awarded to Asians of All Degrees Awarded to Asians, 2009

	Northeast Ohio (11- County)			Ohio			United States		
Level of STEM Degrees	Degrees in All Disciplines Awarded to Asians	STEM Degrees Awarded to Asians	% of Asians Degrees in STEM	Degrees in All Disciplines Awarded to Asians	STEM Degrees Awarded to Asians	% of Asians Degrees in STEM	Degrees in All Disciplines Awarded to Asians	STEM Degrees Awarded to Asians	% of Asians Degrees in STEM
Associate's Degree	71	34	47.9%	273	130	47.6%	34,876	11,093	31.8%
Bachelor's Degree	509	260	51.1%	1,593	672	42.2%	103,273	38,839	37.6%
First Professional Degree	134	97	72.4%	203	154	75.9%	6,109	4,151	68.0%
Master's Degree	146	54	37.0%	532	151	28.4%	32,987	11,025	33.4%
Post-Master's Certificate	1	1	100.0%	3	2	66.7%	482	232	48.1%
Doctorate Degree	16	11	68.8%	75	55	73.3%	3,206	2,024	63.1%
Doctorate Degree-Professional Practice	1	1	100.0%	109	90	82.6%	5,087	3,502	68.8%
Total Number of Degrees Awarded	**878**	**458**	**52.2%**	**2,788**	**1,254**	**45.0%**	**186,020**	**70,866**	**38.1%**

Source: National Science Foundation

A. 6. Selected High-Tech NAICS Categories

NAICS	NAICS Description
333611	Turbine and Turbine Generator Set Units Manufacturing
333612	Speed Changer, Industrial High-Speed Drive, and Gear Manufacturing
333613	Mechanical Power Transmission Equipment Manufacturing
333618	Other Engine Equipment Manufacturing
333911	Pump and Pumping Equipment Manufacturing
333912	Air and Gas Compressor Manufacturing
333922	Conveyor and Conveying Equipment Manufacturing
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing
333994	Industrial Process Furnace and Oven Manufacturing
333995	Fluid Power Cylinder and Actuator Manufacturing
333999	All Other Miscellaneous General Purpose Machinery Manufacturing
334111	Electronic Computer Manufacturing
334112	Computer Storage Device Manufacturing
334113	Computer Terminal Manufacturing
334119	Other Computer Peripheral Equipment Manufacturing
334210	Telephone Apparatus Manufacturing
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing
334290	Other Communications Equipment Manufacturing
334310	Audio and Video Equipment Manufacturing
334411	Electron Tube Manufacturing
334412	Bare Printed Circuit Board Manufacturing
334413	Semiconductor and Related Device Manufacturing
334414	Electronic Capacitor Manufacturing
334415	Electronic Resistor Manufacturing
334416	Electronic Coil, Transformer, and Other Inductor Manufacturing
334417	Electronic Connector Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
334419	Other Electronic Component Manufacturing
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables
334514	Totalizing Fluid Meter and Counting Device Manufacturing
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
334516	Analytical Laboratory Instrument Manufacturing
334517	Irradiation Apparatus Manufacturing
334518	Watch, Clock, and Part Manufacturing
334519	Other Measuring and Controlling Device Manufacturing
334611	Software Reproducing
334612	Prerecorded Compact Disc (except Software), Tape, and Record Reproducing
334613	Magnetic and Optical Recording Media Manufacturing
335311	Power, Distribution, and Specialty Transformer Manufacturing
335312	Motor and Generator Manufacturing
335313	Switchgear and Switchboard Apparatus Manufacturing
335314	Relay and Industrial Control Manufacturing
336411	Aircraft Manufacturing
336412	Aircraft Engine and Engine Parts Manufacturing
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing
336414	Guided Missile and Space Vehicle Manufacturing
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing
486110	Pipeline Transportation of Crude Oil
486210	Pipeline Transportation of Natural Gas
486910	Pipeline Transportation of Refined Petroleum Products
486990	All Other Pipeline Transportation
511210	Software Publishers
541219	Other Accounting Services

A. 6. Selected High-Tech NAICS Categories (Continued)

NAICS	NAICS Description
541310	Architectural Services
541330	Engineering Services
541360	Geophysical Surveying and Mapping Services
541380	Testing Laboratories
541511	Custom Computer Programming Services
541512	Computer Systems Design Services
541614	Process, Physical Distribution, and Logistics Consulting Services
541620	Environmental Consulting Services
541690	Other Scientific and Technical Consulting Services
541711	Research and Development in Biotechnology
541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)
541720	Research and Development in the Social Sciences and Humanities

A. 7. Selected Non-High-Tech NAICS Categories

NAICS	NAICS Description
212111	Bituminous Coal and Lignite Surface Mining
212112	Bituminous Coal Underground Mining
212113	Anthracite Mining
212234	Copper Ore and Nickel Ore Mining
212291	Uranium-Radium-Vanadium Ore Mining
212299	All Other Metal Ore Mining
212322	Industrial Sand Mining
212325	Clay and Ceramic and Refractory Minerals Mining
212391	Potash, Soda, and Borate Mineral Mining
213111	Drilling Oil and Gas Wells
213112	Support Activities for Oil and Gas Operations
213113	Support Activities for Coal Mining
213114	Support Activities for Metal Mining
221210	Natural Gas Distribution
221330	Steam and Air-Conditioning Supply
237110	Water and Sewer Line and Related Structures Construction
237120	Oil and Gas Pipeline and Related Structures Construction
237130	Power and Communication Line and Related Structures Construction
237990	Other Heavy and Civil Engineering Construction (Power plant, hydroelectric, construction)
238220	Plumbing, Heating, and Air-Conditioning Contractors (Solar heating equipment installation)
238290	Other Building Equipment Contractors
311221	Wet Corn Milling
311222	Soybean Processing
311223	Other Oilseed Processing
311999	All Other Miscellaneous Food Manufacturing
316211	Rubber and Plastics Footwear Manufacturing
321999	All Other Miscellaneous Wood Product Manufacturing
322221	Coated and Laminated Packaging Paper Manufacturing
322222	Coated and Laminated Paper Manufacturing
322299	All Other Converted Paper Product Manufacturing
325199	All Other Basic Organic Chemical Manufacturing
325611	Soap and Other Detergent Manufacturing
325612	Polish and Other Sanitation Good Manufacturing
325613	Surface Active Agent Manufacturing
325620	Toilet Preparation Manufacturing
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing
326121	Unlaminated Plastics Profile Shape Manufacturing
326122	Plastics Pipe and Pipe Fitting Manufacturing
326140	Polystyrene Foam Product Manufacturing
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing
326191	Plastics Plumbing Fixture Manufacturing
326199	All Other Plastics Product Manufacturing
326220	Rubber and Plastics Hoses and Belting Manufacturing
326291	Rubber Product Manufacturing for Mechanical Use
326299	All Other Rubber Product Manufacturing
327112	Vitreous China, Fine Earthenware, and Other Pottery Product Manufacturing
327113	Porcelain Electrical Supply Manufacturing
327123	Other Structural Clay Product Manufacturing
327124	Clay Refractory Manufacturing
327125	Nonclay Refractory Manufacturing
327211	Flat Glass Manufacturing
327212	Other Pressed and Blown Glass and Glassware Manufacturing
327215	Glass Product Manufacturing Made of Purchased Glass
327390	Other Concrete Product Manufacturing
327410	Lime Manufacturing
327420	Gypsum Product Manufacturing
327910	Abrasive Product Manufacturing

A. 7. Selected Non-High-Tech NAICS Categories (Continued)

NAICS	NAICS Description
327420	Gypsum Product Manufacturing
327910	Abrasive Product Manufacturing
327992	Ground or Treated Mineral and Earth Manufacturing
327993	Mineral Wool Manufacturing
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing
331111	Iron and Steel Mills
331112	Electrometallurgical Ferroalloy Product Manufacturing
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel
331221	Rolled Steel Shape Manufacturing
331222	Steel Wire Drawing
331311	Alumina Refining
331312	Primary Aluminum Production
331314	Secondary Smelting and Alloying of Aluminum
331315	Aluminum Sheet, Plate, and Foil Manufacturing
331316	Aluminum Extruded Product Manufacturing
331319	Other Aluminum Rolling and Drawing
331411	Primary Smelting and Refining of Copper
331419	Primary Smelting and Refining of Nonferrous Metal (except Copper and Aluminum)
331421	Copper Rolling, Drawing, and Extruding
331422	Copper Wire (except Mechanical) Drawing
331423	Secondary Smelting, Refining, and Alloying of Copper
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)
331511	Iron Foundries
331513	Steel Foundries (except Investment)
331521	Aluminum Die-Casting Foundries
331522	Nonferrous (except Aluminum) Die-Casting Foundries
331524	Aluminum Foundries (except Die-Casting)
331525	Copper Foundries (except Die-Casting)
331528	Other Nonferrous Foundries (except Die-Casting)
332111	Iron and Steel Forging
332114	Custom Roll Forming
332115	Crown and Closure Manufacturing
332116	Metal Stamping
332117	Powder Metallurgy Part Manufacturing
332312	Fabricated Structural Metal Manufacturing
332313	Plate Work Manufacturing
332322	Sheet Metal Work Manufacturing
332410	Power Boiler and Heat Exchanger Manufacturing
332420	Metal Tank (Heavy Gauge) Manufacturing
332431	Metal Can Manufacturing
332439	Other Metal Container Manufacturing
332618	Other Fabricated Wire Product Manufacturing
332710	Machine Shops
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring
332911	Industrial Valve Manufacturing
332912	Fluid Power Valve and Hose Fitting Manufacturing
332913	Plumbing Fixture Fitting and Trim Manufacturing

A. 7. Selected Non-High-Tech NAICS Categories (Continued)

NAICS	NAICS Description
332919	Other Metal Valve and Pipe Fitting Manufacturing
332991	Ball and Roller Bearing Manufacturing
332995	Other Ordnance and Accessories Manufacturing
332997	Industrial Pattern Manufacturing
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing
333111	Farm Machinery and Equipment Manufacturing
333120	Construction Machinery Manufacturing
333131	Mining Machinery and Equipment Manufacturing
333132	Oil and Gas Field Machinery and Equipment Manufacturing
333411	Air Purification Equipment Manufacturing
333412	Industrial and Commercial Fan and Blower Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
333511	Industrial Mold Manufacturing
333513	Machine Tool (Metal Forming Types) Manufacturing
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing
333515	Cutting Tool and Machine Tool Accessory Manufacturing
333518	Other Metalworking Machinery Manufacturing
335110	Electric Lamp Bulb and Part Manufacturing
335121	Residential Electric Lighting Fixture Manufacturing
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing
335211	Electric Housewares and Household Fan Manufacturing
335911	Storage Battery Manufacturing
335912	Primary Battery Manufacturing
335921	Fiber Optic Cable Manufacturing
335929	Other Communication and Energy Wire Manufacturing
335931	Current-Carrying Wiring Device Manufacturing
335932	Noncurrent-Carrying Wiring Device Manufacturing
335991	Carbon and Graphite Product Manufacturing
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing
336311	Carburetor, Piston, Piston Ring, and Valve Manufacturing
336312	Gasoline Engine and Engine Parts Manufacturing
336322	Other Motor Vehicle Electrical and Electronic Equipment Manufacturing
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing
336340	Motor Vehicle Brake System Manufacturing
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing
336391	Motor Vehicle Air-Conditioning Manufacturing
336399	All Other Motor Vehicle Parts Manufacturing
339112	Surgical and Medical Instrument Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339114	Dental Equipment and Supplies Manufacturing
339115	Ophthalmic Goods Manufacturing
339116	Dental Laboratories
423520	Coal and Other Mineral and Ore Merchant Wholesalers
424710	Petroleum Bulk Stations and Terminals
424720	Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)
447110	Gasoline Stations with Convenience Stores
447190	Other Gasoline Stations
454311	Heating Oil Dealers
454312	Liquefied Petroleum Gas (Bottled Gas) Dealers
454319	Other Fuel Dealers
517410	Satellite Telecommunications
541420	Industrial Design Services
562212	Solid Waste Landfill
562920	Materials Recovery Facilities
811310	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance

A. 8. Workforce Educational Attainment in Northeast Ohio by Minority Status, 2010

		Education Level	2010 Estimate	2010 Estimate MOE	2010 Percent	2010 Percent MOE
Minority	High-Tech	HS Graduate or Some College	4,138	1,379	46.9%	11.4%
		Bachelor's Degree	1,577	782	17.9%	8.9%
	Non-High-Tech	Less than HS Graduate	1,548	764	12.6%	6.0%
		Associate Degree	702	529	5.7%	4.1%
		Master's Degree or Higher	325	355	2.7%	2.8%
	Other Industries	HS Graduate or Some College	149,574	6,776	62.9%	2.1%
		Bachelor's Degree	23,470	3,557	9.9%	1.5%
Non-Minority	High-Tech	Less than HS Graduate	1,156	602	1.4%	0.7%
		Associate Degree	7,624	1,597	8.9%	1.8%
		Master's Degree or Higher	13,022	2,102	15.2%	2.2%
	Non-High-Tech	HS Graduate or Some College	68,151	5,120	65.2%	2.8%
		Bachelor's Degree	13,338	1,892	12.8%	1.8%
	Other Industries	Less than HS Graduate	77,086	5,392	6.2%	0.4%
		Associate Degree	115,992	5,624	9.3%	0.5%
		Master's Degree or Higher	143,572	6,828	11.6%	0.6%

Note: Employment estimates are for workers 16-years and older.
Source: American Community Survey Public Use Microdata Sample

A. 9. Minority Employers in the State of Ohio for High-Tech, Non-High-Tech, and All Industries, 2007

	Ohio Employers							
	Firms		Receipts ($Thousands)		Employment		Payroll ($Thousands)	
	Count	Error ±	Count	Error ±	Count	Error ±	Count	Error ±
High-Tech								
African-American Owned	93	33	$237,101	$45,523	1,453	279	$86,118	$13,779
Hispanic Owned	88	48	$139,258	$13,369	689	66	$42,709	$6,833
All Firms	8,139	391	$18,047,443	$1,155,036	95,961	6,142	$5,205,157	$333,130
Non-High-Tech								
African-American Owned	105	59	$737,292	$224,137	2,582	1,487	$75,458	$43,464
Hispanic Owned	37	18	$66,264	$28,626	390	237	$17,292	$14,110
All Firms	12,728	407	$56,213,151	$2,698,231	226,817	10,887	$8,521,269	$5,453,612
All Industries								
African-American Owned	2,881	230	$3,729,452	$298,356	33,298	3,729	$807,569	$103,369
Hispanic Owned	1,339	150	$1,947,951	$155,836	11,562	2,405	$371,084	$47,499
All Firms	170,738	0	$355,599,669	$5,689,595	2,164,602	34,634	$67,624,806	$1,081,997

Source: U.S. Census Bureau, Survey of Business Owners

A. 10. Minority Employers in the United States for High-Tech, Non-High-Tech, and All Industries, 2007

	United States Employers			
	Firms	Receipts ($Thousands)	Employment	Payroll ($Thousands)
High-Tech				
African-American Owned	4,092	$4,607,815	35,919	$2,028,491
Hispanic Owned	8,412	$9,108,794	61,923	$3,424,260
All Firms	267,365	$525,004,525	2,473,817	$148,103,834
Non-High-Tech				
African-American Owned	2,657	$4,181,096	17,840	$552,626
Hispanic Owned	9,399	$17,420,188	80,980	$2,994,587
All Firms	319,817	$1,267,870,849	4,584,836	$177,916,508
All Industries				
African-American Owned	1,921,864	$135,739,834	909,552	$23,334,792
Hispanic Owned	2,260,269	$350,661,243	1,908,161	$54,295,508
All Firms	26,294,860	$10,949,461,875	56,626,555	$1,940,572,945

Source: U.S. Census Bureau, Survey of Business Owners

A Diversity Study of African American and Latino Participation In Growth Technology Industries in Northeast Ohio

Focus Group Content Analysis Summary and Response Frequency Report

By

PolicyBridge

March 2012

Overview

The purpose of this qualitative research is to gather an in-depth understanding of the barriers, opportunities, and behaviors that influence and impact the current and future participation and opportunities for African American and Latino individuals in growth technology industries in Northeast Ohio. This qualitative method of research provided researchers with knowledge about the what, where and when, but also the why and how it is related to the decision-making of African Americans and Latinos in the research topic.

The focus group research technique involved a moderator facilitating a small group discussion between five to eleven self-selected participants. The focus group participants were asked questions about their attitudes, perceptions, opinions, beliefs and knowledge regarding the current participation levels of African Americans and Latinos in growth technology industries; barriers and challenges that impeded their participation; the impact of the current levels of participation on our region's economy and communities; and short-and long-term strategies and tactics that will increase participation leading to sustainable economic competitiveness and creating a stronger economic future for all citizens in the region.

PolicyBridge conducted focus group session in Cuyahoga, Lorain, Stark and Summit Counties during the period of January 4, 2012 through March 8, 2012. Below is the content analysis summary of the responses most frequently received from the seven focus group sessions held with primarily African American and Latino representatives from growth technology industries; secondary and post secondary educational institutions; non-profit organizations that focus on business development and educational attainment; post-secondary students; technology industry professionals and entrepreneurs; and economic development professionals. There were a total of fifty (50) focus group session participants. Of the fifty (50) participants, fifty-two percent (52%) were Latinos; forty percent (40%) were African Americans; and eight percent (8%) were Caucasian Americans.

Summary

Current Participation in Growth Technology Industries

Focus group participants were asked to describe the current level of African American and Latino participation as entrepreneurs/owners, senior level management and professional and skilled workers in growth technology industries in Northeast Ohio. Their responses indicated that in general, participation ranged from low to none in growth technology industries.

When asked to specifically describe participation as entrepreneurs/ownership, senior level management and professional and skilled workers, focus group session participants again expressed that currently there is a lack of or very little African American and Latino participation. There was consensus among the session participants regarding the current participation of non-professional workers in growth technology industries. The perception among the session participants was that there was a higher level of participation among non-professional workers than any of the other employment sectors discussed.

Overall Current Participation

1. *Low participation (33)*
2. *No participation (17)*

Entrepreneur, Senior Level Management and Professional and Skilled Worker Current Participation

1. *Low/No Ownership/Entrepreneur Participation (22)*
2. *Low/No Senior Management Participation(24)*
3. *Low/No Skilled Professional Participation(25)*
4. *Low/No Other Worker Participation(18)*
5. *Most Participation – Other Workers(24)*

Barriers and Challenges

Some of the most frequent responses given concerning the barriers and challenges that have led to the current level of African American and Latino participation in growth technology industries were:

1. *Lack of funding for entrepreneurs(35)*
2. *Lack of entrepreneurial role models and technology industry networks(34)*
3. *Lack of entrepreneurial capacity and business knowledge(33)*
4. *Lack of entrepreneurial training program (30)*

In addition to the responses detailed above, the following barriers and challenges were most frequently given during focus group sessions:

1. *Lack of family and community support to assist students(27)*
2. *Lack of Science, Technology, Engineering and Mathematics (STEM) education, skills and capacity(26)*
3. *The current education system is failing students(21)*
4. *Community cultures and value systems(19)*

Impact on Northeast Ohio's Overall Economy and Communities

Focus group session participants expressed a deep concern about the impact that the current level of African American and Latino participation in growth technology industries is having on Northeast Ohio's economy and communities. In order of the most frequent response received from session attendees, the following topical categories were identified as having an impact on the Northeast Ohio's economy and communities currently:

1. *Lack of community and economic growth(32)*
2. *Lack of business growth(29)*
3. *Human service challenges increase(29)*
4. *High unemployment and poverty(20)*
5. *Drain on community resources(16)*
6. *Population loss(14)*

Future Impact on Northeast Ohio's Overall Economy and Communities

Session attendees were also asked to provide their thoughts about the future impact on Northeast Ohio's economy and communities if current African American and Latino participation levels in growth technology industries were to increase significantly. Most of the attendees agreed that the overall economy and the quality of people's lives in the Northeast Ohio would change for the better if African American and Latino participation in growth technology industries were to increase significantly.

A few of the reasons for their opinions included: greater participation would lead to greater success as measured by increases in gross revenue and overall employment; greater gross revenues would lead to increases in individual and collective African American and Latino group wealth; and increases in individual and collective group wealth would increase the overall wealth and prosperity in Northeast Ohio.

Given this perspective, focus group session participants identified five categories where the future Northeast Ohio's economy and communities would be improved:

1. *Community and economic growth(37)*
2. *Reduction in unemployment and poverty(35)*
3. *Business growth(34)*
4. *Population increases(19)*
5. *Improved perceptions of the community and region(18)*

Short-Term Strategies and Tactics to Increase Participation

The responses received from session attendees regarding increasing both opportunities and participation among African Americans and Latinos in growth technology industries were tightly grouped in a range of 8 (32 to 38).

There was broad consensus among the session attendees that short-term strategies should build on existing programs, services and activities. There was also strong participant consensus regarding the need for those organizations offering the programs, services and activities to

intensify the depth and breadth of their economic competitiveness and inclusion work to incorporate a sense of urgency if indeed they want to significantly improve both opportunities and participation for African Americans and Latinos in growth technology industries in the future.

The short-term strategies and tactics identified in the order of response most frequently articulated are:

1. *Develop entrepreneurial mentoring and role modeling programs(38)*
2. *Increase existing and create new "angel funding" opportunities(36)*
3. *Increase African American and Latino student participation in STEM education classes and fields(36)*
4. *Increase outreach, engagement, and strategic partnerships with African American and Latino professional and community organizations and group(36)*
5. *Increase African American and Latino Ownership and CEO opportunities(36)*
6. *Increase existing and develop additional entrepreneurial training programs(32)*

Long-Term Strategies and Tactics to Increase Participation

The responses received were not as tightly grouped as the short-term strategies and tactics suggested. The range for the long-term strategies and tactics to increase participation responses was 17 (23 to 40). There was an overwhelming articulation among session participants that the most impactful strategy to increase both opportunities and participation is to develop a sustainable pipeline of African American and Latino students engaging in K-12 STEM classes, graduating high schools with high proficiencies in math and science and a burning desire to pursue post-secondary education in STEM-related fields. Thus these strategies and tactics would culminate in an increasing number of African American and Latino students graduating from colleges and universities with STEM field degrees and seeking entrepreneurial and employment opportunities in growth technology industries.

The long-term strategies and tactics in order of the most frequently given are as follows:

1. *Improve the overall education system and STEM pipeline for African American and Latino students(40)*
2. *Align STEM education with technology industry needs(36)*
3. *Increase funding for outreach and engagement to African American and Latino parents, students and communities(35)*
4. *Increase funding to support "new start-up" ownership opportunities(34)*
5. *Collect and regularly report metrics on status of participation among African Americans and Latinos(30)*
6. *Improve the African American and Latino community's cultures towards STEM education and opportunities(23)*

Critical Partners Needed to Increase Participation

There were a wide array of stakeholders that the session attendees identified as being critically important to successfully increasing African American and Latino participation in growth technology industries. The following were the responses received most often during the focus group sessions:

1. *Educational institutions and systems(40)*
2. *Technology industries and businesses(39)*
3. *Elected and appointed governmental officials(37)*
4. *Technology-focused economic development corporations(37)*
5. *African American and Latino parents, families and communities(35)*
6. *Citizens and key community leaders(34)*
7. *Philanthropic, non-profit and civic organizations(32)*

Unspoken Rules of Engagement and Cultural Norms that Must be Addressed

There was an overwhelming sense among the session attendees that activities need to be intensified and a stronger sense of urgency created to significantly increase and improve current conditions. Many believed that the standard operating policies, procedures and process are lacking and need to be "ramped up." To change existing conditions and intensive activities session attendees suggested that deeper insights are needed to understand and remove road blocks and impediments that reinforce the cultural norms that serve as barriers to change.

The groups indentified several strategies and tactics that would remediate unspoken rules of engagement and existing cultural norms that serve as barriers to change. Below is an ordinal list of their responses:

1. *Be aware of both community and organizational cultural norms and barriers(36)*
2. *Develop honest and authentic collaborations with the African American and Latino communities(32)*
3. *Identify and cultivate champions to facilitate action(24)*
4. *Spread focus of activities beyond and outside Cuyahoga County(22)*
5. *Hold public officials accountable for increasing economic competitiveness and inclusion strategies(19)*

Additional Comment(s)

Of all the responses and comments received from focus group attendees, there were three general comments that reflected the depth of perspectives about how to improve the current environment for African Americans and Latinos. There was an overall sense that technology-focused economic development corporations must do more to bridge the enormous participation gap that exist among African Americans and Latinos in growth technology industries. Technology-focused economic development corporation need not see building the necessary support bridges as additional work with very little return of investment. Instead they should evaluate their activities in this area as creating a strong foundation that will heavily contribute to the future economic competitiveness of Northeast Ohio.

Session participants also expressed grave concerns about the lack of basic business preparation, financing and skill capacities of African American and Latino entrepreneurs especially in technology-related industries. There were questions raised about not just African American and Latino education competencies and business acumen, but there was significant concern about the lack of available funding to support these entrepreneurs as they develop their business ideas while transitioning into new business start-ups.

During the focus group session in Lorain one of the local Latino technology business owners made a statement that was totally supported by all the session attendees. The comment was a reference to the lack of African American and Latino outreach and engagement and seemingly

lack of interest by African Americans and Latinos in technology-related industries. The statement is as follows: “If you beat a dog often enough, it will act as a dog that has been always beaten. Thus, if you want more from African American and Latino communities there really needs to be an honest relationship with equity for all involved in the relationship.”

This statement defines a clear lack of trust for those representing systems and the need to re-examine tactics and methods that are used to engage the African American and Latino communities.

Focus Group Questions and Response Frequency Report

1. How would you describe the current level of participation among African Americans and Latinos in growth technology industries in Northeast Ohio?

Content Topical Categories	Response Frequency
Low Participation	33
No Participation	17

2. How would you describe the current level of participation among African American and Latino technology-focused entrepreneurs, senior management technology professionals, and the technology-related workforce in Northeast Ohio?

Content Topical Categories	Response Frequency
Low/No Ownership/Entrepreneur Participation	22
Low/No Senior Management Participation	24
Low/No Skilled Professional Participation	25
Low/No Other Worker Participation	18
Most Participation – Other Workers	24

3. What are the barriers and challenges that have created the current level of participation (or lack thereof) among African Americans and Latinos in growth technology industries in Northeast Ohio?

Content Topical Categories	Response Frequency
Lack of Family & Community Support & Capacity to Assist Students	27
Lack of Entrepreneurial Training Programs	30
Lack of Entrepreneurial Capacity & Business Knowledge	33
Lack of Science, Technology, Engineering, and Mathematics Education, Skill & Capacity	26
Current Education System is Failing Students	21

Community Cultures & Value Systems	19
Lack of Funding for Entrepreneurs	35
Lack of Entrepreneurial Role Models & Technology Industry Networks	34

4. What has been the impact of the current level of participation among African Americans and Latinos in growth technology industries to Northeast Ohio's overall economy and communities?

Content Topical Categories	Response Frequency
Lack of Community & Economic Growth	32
Lack of Business Growth	29
Human Service Challenges Increase	29
High Unemployment & Poverty	20
Drain on Community Resources	16
Population Loss	14

5. If the current level of participation among African Americans and Latinos in growth technology industries continues, what will be the future impact to Northeast Ohio's overall economy and communities?

Content Topical Categories	Response Frequency
Community & Economic Growth	37
Business Growth	34
Reduction in Unemployment & Poverty	35
Population Increase	19
Improved Perception of Community & Region	18

6. Please describe how you would in the short-term and the long-term increase opportunities and participation among African Americans and Latinos in growth technology industries in Northeast Ohio?

Short-Term Content Topical Categories	Response Frequency
Increase African American and Latino Ownership & CEO Opportunities	36
Increase Outreach, Engagement & Strategic Partnerships with African American & Latino professional & community organizations and groups	36
Develop Entrepreneurial Mentoring & Role Modeling Programs	38
Increase Existing & Develop Additional Entrepreneurial Training Programs	32
Increase existing & Create New "Angel Funding" Opportunities	36
Increase African American &Latino student Participation In STEM Education Classes & Fields	36
Long-Term Content Topical Categories	**Response Frequency**
Improve the Overall Education System & STEM Pipeline for African American & Latino Students	40
Improve African American & Latino Community's Cultures Toward STEM Education	23
Align STEM Education with Technology Industry Needs	36
Increase Funding to Support "New Start-up" Ownership Opportunities	34
Increase Funding for Outreach & Engagement to African American & Latino Parents, Students & Communities	35
Collect & Regularly Report Metrics on the Status of Participation Among African Americans & Latinos	30

7. Who are the critical partners that would be needed to increase both short and long-term opportunities for participation among African Americans and Latinos in growth technology industries in Northeast Ohio?

Content Topical Categories	Response Frequency
Technology Industries & Businesses	39
Elected & Appointed Governmental Officials	37
Educational Institutions and Systems	40
Philanthropic, Non-Profit & Civic Organizations	32
African American & Latino Parents, Families, Communities	35
Technology-Focused Economic Development Corporations	37
Citizens & Key Community Leaders	34

8. What are the key drivers that will help African Americans and Latinos to enter and thrive in growth technology industries? What are the unspoken rules of engagement or cultural norms that must be addressed?

Content Topical Categories	Frequency Response
Spread Focus of Activities to Areas Beyond & Outside Cuyahoga County	22
Identify & Cultivate Champions to Facilitate Action	24
Develop Honest & Authentic Collaborations	32
Hold Public Officials Accountability for increasing Economic Competitiveness and Inclusion Strategies	19
Be Aware of Both Community & Organizational Cultural Norms & Barriers	36

9. Are there any additional comments/suggestions you would like to make?

"If you beat a dog often enough it will act as a dog that is always beaten—if we want more from these communities there needs to be an honest relationship with equity for all."

A Diversity Study of African American and Latino Participation

In Growth Technology Industries in Northeast Ohio

K-12 Science, Technology, Engineering and Mathematics (STEM) Education In Ohio Report

By

PolicyBridge

March 2012

Student Interest in K-12 STEM Education

STEM (Science, Technology, Engineering, and Mathematics) education is an integral part of our educational system and is necessary in order to keep our economy competitive. According to the Ohio K-12 STEM Education Report Card for 2011, STEM education provides younger workers with an opportunity to earn more over the course of their careers and provides more seasoned workers with skill sets that can be adapted to employer needs as the economy continues to transition over the next decade.

Additionally, early identification and mentoring by parents, teachers and others who are a part of the socialization process appears to be one of the keys to success. According to the *Report Card,* a young person's receptivity to STEM topics can close relatively early; and one solution to Ohio's STEM pipeline issue is to shape strategies according to known gender and ethnic differences in STEM education. Ohio's K-12 STEM Education Report Card for 2011 states that the following groups have varied interests in STEM education. Among American Indians, approximately 25%-in the year 2002 expressed interest in STEM education, as compared 28% in 2010.

Among the Asian American population -in 2002, 32% expressed interest in STEM related topics as compared to 27% in 2011. In the African American population, 22% expressed interest in STEM education in 2002. That number had dropped to 17% by 2011. This decrease in interest may indicate a need to restructure and increase recruitment activities so that they are better aligned with this targeted population's interests. Among the Hispanic population-in 2002, the percentage interested in STEM education was approximately 20%--and had increased to 22% by 2011. Evaluating the Caucasian population in 2002, 21% showed interest in STEM education; that number had increased to 23% by 2011.

Examining the populations that were studied, there were increases in interest in STEM education among American Indians, Hispanics and Caucasians. In contrast, interest actually decreased among Asian Americans and African Americans. This decrease in interest could have far-reaching implications for individual upward mobility, as well as having a negative impact on the collective group. According to the Ohio K-12 STEM Education Report Card for 2011, by the year 2018, the state of Ohio will need to fill 274,000 STEM-related jobs. If this decrease in interest continues, the ability to fill these positions could become more difficult which will have negative implications for the economy and stability of the state of Ohio. Additionally, it is projected that in the next decade, the demand in the U.S for engineers and scientist will increase at four times the rate of some other professions. If this increase in demand continues while the decrease in interest among certain groups continues, this could result in a shortage of qualified applicants to fill positions-creating a void at the state level, which will have a negative impact nationally and ultimately- globally.

Ohio's K-12 STEM Education Report Card for 2011 also examined interest in STEM education by gender. In 2002, 9% of females as compared to 34% of males expressed interest in STEM education. In 2011, 11% of females expressed interest in STEM education as compared to 34% of males. These figures can be used to strategically structure programs that assist in cultivating this interest into future career paths.

POPULATION	% STEM EDUCATION INTEREST AND YEAR	% STEM EDUCATION INTEREST AND YEAR
American Indians	25% (2002)	28% (2010)
Asian Americans	32% (2002)	27% (2011)
African Americans	22% (2002)	17% (2011)
Hispanic Americans	20% (2002)	22% (2011)
Caucasian Americans	21% (2002)	23% (2011)

STEM Education and Ohio's National Ranking

The Ohio K-12 STEM Education Report Card ranks and compares Ohio to national totals. In 2009, the average 8th grade mathematics score in Ohio was 286 as compared to the score for the U.S which was 282. The average 8th grade science score in 2009 was 158 for Ohio, as compared to the lower score of 149 for the U.S.

In 2010, the average ACT science score for OHIO was 21.8, as compared to a U.S. score of 20.9. In 2010, Ohio's average ACT math score was 21.5 and for the U.S, that number was 21. Examining the total percentage of graduates taking the ACT in 2010, there was a total of 66% in Ohio and 47% in the U.S.

Additionally, the average SAT score in math was 548 and for the U.S., that number was 516. In Ohio, in 2010, the percentage of graduates taking the SAT-mathematics was 21% as compared to 47% for the U.S. Finally, in 2010, 46% of students in Ohio took AP mathematics as compared to 42% for the U.S.

Rank	NEAP Scores (National Assessment of Educational Progress)	Ohio	U.S.	
20	2009 Eight Grade Mathematics Average Score	286	282	
7	2009 Eight Grade Science Average Score	158	149	
	ACT Scores & Percentage Participation 2010			
20	Ohio's 2010 Average ACT Science Score	21.8	20.9	
25	Ohio's 2010 Average ACT Math Score	21.5	21.0	
20	Percentage of Graduates Taking the ACT in 2010	66%	47%	
	SAT Scores & Percentage Participation 2010			
22	Ohio's 2010-Average SAT –Mathematics	548	516	
28	Ohio's 2010- Percentage of Graduates Taking SAT Mathematics	21%	47%	
28	Ohio's 2010- H. S. Students Taking AP Mathematics	46%	42%	
12	Ohio 2010-H.S. Students Taking AP Exams (All Disciplines)	48,633	1,802,144	
	STEM Workforce: Stem Degrees Produced 2007			
31	Bachelor Degrees in Nat. Sci. & Engineering conferred per 1000, 18-24yrs. Old	7.8	8.1	
17	Science & Engineering Grad. Students per 1000, 25-34 yrs. old	13.0	12.3	

Selected Local STEM Sites

Akron and National Inventors Hall of Fame School

The National Inventors Hall of Fame School was opened in 2009. It is a middle school where students have the opportunity to work with faculty and students from the University of Akron, inventors and STEM-related organizations and businesses. Because of their innovative teaching techniques, the school was featured on CNN's Anderson Cooper 360 program.

A partnership including the City of Akron, the University of Akron, the National Inventors Hall of Fame Foundation, the Greater Akron Chamber and Akron Tomorrow worked collectively to make the idea for this innovative institution a reality.

A primary goal of the school is to improve students' performance in science, mathematics and technology. Eligible students include those from Akron Public Schools in grades 5-8 as well as other students from the greater Akron region.

Cleveland and MC2STEM High School

The MC2STEM High School in Cleveland opened during the 2008-2009 academic year. It is one of the two STEM schools included in the Cleveland Metropolitan School District's New and Innovative School plan. The MC2STEM High School focuses on creating a realistic workplace environment for the student. This is done in an effort to provide the student with real-world experience. The school follows a yearlong academic calendar. Additionally, each grade level is grounded in a different STEM discipline. The school also partners with various institutions of higher learning, such as Cleveland State University and Case Western Reserve University. Because of this collaboration, senior high school students have the opportunity to take their senior high school courses-while earning freshman college credits.

Although enrollment is open to all interested students, special consideration is given to students who have demonstrated interest in STEM disciplines. MC2STEM is a regional high school and for that reason, 25% of its student seats are available to students residing outside of Cleveland.

Cleveland and Design Lab High School

The Design Lab High School is focused on Art and Industrial Design. It is similar to the MC2STEM High School because of its innovative approach. In an effort to fully utilize community resources, the Design Lab High School partners with local institutions such as Tri-C's Metropolitan campus, Cleveland State's College of Engineering, Kent State University's Urban Design Collaborative, the Cleveland Institute of Art and Case Western Reserve University.

Although enrollment is open to all interested students, special consideration is given to students who have demonstrated both interest and aptitude in STEM disciplines. The Design Lab High School is a regional high school and for that reason, 25% of its student seats are available to students residing outside of Cleveland.

References

1. **Ohio's K-12 STEM Education Report Card 2011.**
2. ***Innovating Education at Northeast Ohio's STEM Schools*** **in ThePlus: Northeast Ohio, 2011.**

A Diversity Study of African American and Latino Participation

In Growth Technology Industries in Northeast Ohio

An Inventory of Science, Technology, Engineering and Mathematics (STEM) Programs and Best Practices Report

By

PolicyBridge

March 2012

Introduction

The following programs are selected *Best Practices* for K-12 STEM Education. These programs are innovative and strategically placed throughout the country. They service targeted populations and provide an entry point for students who may not have the opportunity or exposure otherwise.

These programs have been evaluated and found to be effective. STEM schools and programs have impacted both students and teachers. They are revolutionizing how students learn and preparing them for future careers. Students in STEM programs are exposed to many disciplines, as well as having the opportunity to learn teamwork and enhance personalized learning skills. Students also have an opportunity to get real world experience that translates into the collegiate setting, as well as the work place.

The programs that are included in this inventory are helping to develop a pipeline in an effort to ensure continued participation and future success. A variety of entities are represented-including public school districts, institutions of higher learning and community and business organizations. STEM education is a very important part of our future and plays an integral role in our ability to compete globally.

Engineering is Elementary

Program Overview:
Founded in August 2003, the Engineering is Elementary (EiE) project aims to foster engineering and technological literacy among children. EiE is creating a research-driven, standards-based and classroom-tested curriculum that integrates engineering and technology concepts and skills with elementary school science topics. EiE lessons not only promote STEM learning, but also connect with literacy and social studies. Storybooks featuring children from a variety of cultures and backgrounds introduce students to an engineering problem. Students are then challenged to solve a similar hands-on engineering design challenge in the classroom. The EiE project also helps elementary school educators enhance their understanding of engineering concepts and pedagogy through professional development workshops and resources.

Reach/Target Student Population:
As of December 2009, the EiE program has reached more than 15,500 elementary school teachers and 1,000,000 students in first through fifth grades and more than 1,300 schools in all 50 states. A core commitment of EiE is ensuring that all students can envision themselves as engineers, with a particular interest paid to reaching those who are "at-risk" and underrepresented in STEM fields.

Project SEED

Program Overview:
Established in 1968, Project SEED is an American Chemical Society (ACS) program for high school students from economically disadvantaged backgrounds who have an interest in pursuing science as a career. The program provides an opportunity for students to participate in scientific research and learn what it is like to work in science-related fields through on-the-job experience. Project SEED places students in academic, industrial and governmental research laboratories for eight-to-10 weeks during the summer months to perform hands-on scientific research under the supervision of a volunteer scientist-mentor. Project SEED offers a stipend and three opportunities to students: 1) Summer I is the first summer experience, open to students who have completed the 10th grade and at least one year of high school chemistry; 2) Summer II allows students to return for a second summer of more intensive research; and 3) a freshman college scholarship, for Project SEED graduates, offers up to $5,000 for students planning to major in the chemical sciences or chemical engineering.

Reach/Target Student Population:
Every year, nearly 400 students participate in Project SEED at more than 100 institutions. In addition, up to 300 volunteer scientist mentors participate in the program (no mentor has more than two students). Since 1968, nearly 9,000 high school students have participated in Project SEED. Approximately 70 percent of the students are from underrepresented groups in the sciences- primarily African-American, Hispanic and American Indian. In addition, 62 percent are female.

ASSET Inc.

Program Overview:
ASSET Inc. (Achieving Student Success through Excellence in Teaching) is an education improvement nonprofit that provides teacher professional development and hands-on curriculum materials for grades K-8. Since its inception in 1994 by a group of corporate, foundation and community partners, ASSET has quietly, but effectively, established itself as a major driver of systemic education improvement in Pennsylvania. Initiated as a pilot program in two school districts, ASSET received a five-year grant from the National Science Foundation to serve additional districts before successfully transitioning to a self-sustainable, fee-for-service model. ASSET's approach is modeled on the National Science Resources Center's (NSRC) five essential components of science education reform:

- standards-based curriculum materials;
- ongoing teacher professional development;
- refurbishment of hands-on curriculum materials;
- assessment and program evaluation; and,
- community and administrative involvement.

In 2006, Pennsylvania Governor Edward G. Rendell launched a statewide initiative to improve elementary science education called *Science: It's Elementary* and selected ASSET to manage and design the program in partnership with the Pennsylvania Department of Education. To date, the Pennsylvania Legislature has invested more than $50 million in this landmark initiative. President Barack Obama cited *Science: It's Elementary* as an example of a state taking steps to encourage inquiry-based science statewide. ASSET also has received national acclaim for its science education improvement model, which was cited by the NSRC as a "model for the nation."

Reach/Target Student Population:
Currently, ASSET and *Science: It's Elementary* collectively serve 180 school districts, charter and private schools, directly impacting 5,000 teachers and 142,000 students across Pennsylvania.

Biotech Partners

Program Overview:

Founded in 1993 as part of a 30-year Development Agreement between Bayer HealthCare and the City of Berkeley, Biotech Partners is a nationally recognized model for school-to-career partnerships. The organization provides a comprehensive, hands-on academic and job-training program in Berkeley and Oakland public schools for populations typically underrepresented in the sciences – especially students of color, young women and those from low-income households. Biotech Partners' unique multi-year program consists of a career-focused, hands-on science and technology curriculum from 11th grade through community college; paid-summer internships for high school students; yearlong co-op jobs for community college participants; and, support services to help each student achieve success. The program prepares young people for skilled technical positions in the ever-expanding bioscience and health care industries. Biotech Partners promotes self-motivation and economic self-sufficiency. This program is designed to build students' confidence in their ability to succeed in the world both academically and professionally.

Reach/Target Student Population:
Each year, Biotech Partners works with approximately 150 young people at Berkeley High School, Oakland Technical High School and the Peralta Community College District. Nearly all (97 percent) are students of color, 53 percent are young women and many are from low-income households.

Breakthrough Collaborative

Program Overview:
Founded in San Francisco in 1991, Breakthrough Collaborative prepares students for challenging, college-preparatory science and math courses and recruits diverse young people to teach these subjects. Breakthrough middle school students are primarily

low-income students of color who dream of college diplomas. Breakthrough teachers are outstanding college and high school students who dream of careers as CEOs, doctors and lawyers. Through an innovative Students Teaching Students model, Breakthrough teachers are trained to teach middle school students in six-week summer sessions, after-school tutorials and weekend events. The results are transformative. Some 80 percent of Breakthrough middle school students enter college-preparatory high schools; 84 percent of Breakthrough teachers express interest in pursuing careers as teachers. Breakthrough currently has 34 sites in 28 cities across the United States.

Reach/Target Student Population:
Breakthrough recruits high-potential students, most of whom are low-income and of color. All Breakthrough students demonstrate academic motivation and potential, and all face significant obstacles to realizing their aspirations. Specifically:

- 91 percent are students of color;
- 68 percent qualify for free or reduced-price lunch;
- 39 percent speak English as a second language;
- 61 percent will be the first in their families to attend college; and,
- 39 percent live in single-parent households.

In 2009, Breakthrough served 2,440 middle school students, 2,998 high school students and 723 college students.

Community Resources for Science (CRS)

Program Overview:
Founded in 1997, Community Resources for Science (CRS) is building a community of educators working together to get young students excited about learning through science. CRS serves as a hub for teachers, science and environmental education programs, and scientists, providing information and support to improve elementary science learning. In addition to an in-class volunteer scientist role model program called Community in the Classroom (CIC), CRS programs encompass teacher professional development workshops and pre-service teaching courses, a teacher membership program for year-round assistance with science content questions, and various research and development projects with program providers, agencies and school districts.

Reach/Target Student Population:
CRS's service area is public elementary schools in the East Bay Area, Calif., primarily in the diverse, urban districts of Oakland and Berkeley. In these districts, 37 percent of students are African-American, 22 percent are Hispanic and 10 percent are Asian. More than half receive free and reduced price lunches. CRS serves almost 500 teacher members and works with roughly 150 teachers (in-service and pre-service) in its professional development workshops and classes. In 2009, CRS placed more than 190 scientist role model volunteers in more than 200 classrooms- directly engaging and inspiring more than 5,400 students in exploration through science.

Detroit Area Pre-College Engineering Program (DAPCEP)

Program Overview:
Since 1976, the Detroit Area Pre-College Engineering Program (DAPCEP) has been preparing and motivating students to pursue higher education and careers in engineering and technology fields. DAPCEP touches the lives of more than 5,000 K-12 students annually, exposing them to challenging activities that enrich traditional academic programs. By participating, students develop networks of peers investigating similar careers, make important contacts with educators and professionals, and receive early acclimation to college life.

Reach/Target Student Population:
DAPCEP's K-12 student population encompasses individuals and families from various cultural and socio-economic backgrounds. Since its inception in 1976, DAPCEP has impacted the lives of more than 150,000 youth. The student population has the following demographic profile:
- Primarily African-American and Hispanic;
- 70 percent residents of the City of Detroit;
- 50 percent female; and,
- 30 percent median household income at or below poverty.

Developmental Approaches in Science, Health and Technology (DASH)

Program Overview:
Developmental Approaches in Science, Health and Technology (DASH) is a comprehensive K–6 program comprised of hundreds of interconnected, developmentally appropriate, hands-on activities that are aligned with national standards. The goal of DASH is to engage students in the excitement of questioning

and making sense of things unknown, inventing and building to solve problems, and caring for themselves through their experiences in science, health and technology learning. Program content is sequential and spiraled to promote reinforcing multi-year development of concepts and skills. Students work inside and out of the classroom as a research community, modeling the real-world roles of scientists and technologists with teachers as research-team leaders. Established in 1986, DASH is designed for heterogeneous classrooms and is effective with both genders and diverse ethnic, socio-economic and ability student populations. DASH aligns with National Research Council Standards and American Association for the Advancement of Science Benchmarks and is adaptable to state standards. DASH recognizes teachers' needs for content, skills and pedagogy instruction and requires teacher training.

Reach/Target Student Population:
Over the last 20 years, DASH has trained more than 11,000 teachers, using a cadre of 175 certified trainers in 26 states. The number of students receiving a DASH experience is in the millions. The materials have been designed for all K–6 students in U.S. public/private schools. Student populations have included:
• those in predominantly urban and rural settings;
• high-ability and special-education students;
• high and low socio-economic groups;
• African-American, Hispanic, American Indian, Asiatic and Pacific Islander groups; and,
• males and females.

<u>The Environment as a Context for Opportunities in School (ECOS)</u>

Program Overview:
Established in 2002 in Houston at Baylor College of Medicine, the Environment as a Context for Opportunities in School (ECOS) project responds to the need to improve K-5 science education in schools with high enrollments of minority and economically disadvantaged students. ECOS aims to develop and evaluate a scalable model for integrating science content across the elementary school curriculum using environmental themes that are relevant to students. Specific project objectives are to: (1) collaboratively design, implement and evaluate an instructional program in elementary schools that integrates science, health, reading/language arts and mathematics; (2) improve teacher practice through summer and school-year professional development over multiple years; and, (3) support school-wide reform of teaching and learning. ECOS is funded by the National Institute of Environmental Health Sciences (NIEHS), a component of the National Institutes of Health (NIH).

Reach/Target Student Population:
Through 2007, 11 elementary schools, approximately 140 teachers and 3,500 students from the Houston Independent School District participated each school year. The ECOS program is being implemented across all grades K–5 in the participating schools. The project is aimed at schools with high enrollments of underrepresented minority (African-American and Hispanic) and economically disadvantaged students (based on statistics for free/reduced lunch). For comparison purposes, two schools within the same geographic area with small enrollments of students in these groups are participating in the program.

EQUALS

Program Overview:
Developed by the University of California, Berkeley's Lawrence Hall of Science; EQUALS mission is to improve math education for all students, particularly females, students of color and children from bilingual and low-income families. It offers programs for teachers, counselors, administrators and parents that increase access to and equity in mathematics.

EQUALS' Innovative Investigation curriculum units and *Get It Together* math puzzles increase students' and teachers' awareness of the role mathematics plays in everyday life. In addition, they build self-confidence in mathematical abilities, improve problem-solving skills and encourage perseverance. Since 1977, hundreds of thousands of educators have participated in EQUALS workshops nationwide-helping millions of students achieve success in math.

Reach/Target Student Population:
EQUALS helps all children everywhere experience success in mathematics with a special focus on making math accessible to females, students of color and children from bilingual and low-income families. The program has significant impact nationwide and internationally with teacher training sites in 65 school districts in 34 states and at nine international locations on five continents. In addition to professional development programs, a network comprised of thousands of teachers use EQUALS' curriculum materials in their classrooms, reaching tens of thousands of pre-K-12 students each year.

Family Math and Matematica Para La Familia

Program Overview:
Founded in 1981, Family Math and Matematica Para la Familia is a series of books and workshops that provide parents, teachers and other adults with the tools to become more effective partners in helping children succeed in mathematics. Developed by the Lawrence Hall of Science at the University of California, Berkeley, Family Math shows all participants that math is understandable and relevant to their lives. It achieves this through hands-on, problem-solving activities that emphasize math concepts. Every activity is designed so that an adult and child can work together on it.

The program provides professional development workshops and curriculum materials to parents, teachers and other community members enabling them to establish Family Math programs in their schools and communities.

Reach/Target Student Population:
Family Math is a worldwide phenomenon. From South Africa to New Zealand to Central and South America to the United States, more
than five million families are learning and enjoying math together. The program is designed for K-8 students and their families with special emphasis on addressing the needs of traditionally underserved groups. The international scope of the program makes it suitable
for families in diverse cultures and socio-economic levels.

Full Option Science System (FOSS)

Program Overview:
Founded in 1986, the Full Option Science System (FOSS) was created to address the concern that young students were not being provided with an adequate science education. FOSS is a K-8 program developed by the Lawrence Hall of Science at the University of California, Berkeley, under three separate National Science Foundation grants. Originally developed and trial-tested in urban and suburban San Francisco Bay area school districts, today FOSS is used in every state in the country. FOSS materials are designed to provide meaningful science education for students in diverse American classrooms-preparing them for life in the 21st century.

There are 26 K-6 modules and nine for middle school grades. Each module includes student materials, a teacher guide, a module-specific teacher preparation video, a

student reading book and a web site. Delta Education is the publishing partner and works with the Lawrence Hall of Science to provide professional development for teachers.

Reach/Target Student Population:
FOSS is used in every state in the country with more than 100,000 teachers and two million students participating and is in approximately16 percent of the nation's school districts. The target population is all K-8 students and teachers, particularly those who do not have a strong science background.

Foundational Approaches in Science Teaching

Program Overview:
Founded in September 1966, Foundational Approaches in Science Teaching (FAST) is a three-year inquiry program providing hands-on activities for intermediate and middle school students in sixth through eighth grade. It is comprised of three one year sequential courses, including: FAST 1, The Local Environment; FAST 2, Matter and Energy in the Biosphere; and, FAST 3, Change Over Time. The goal is to develop a scientifically literate student who has the background necessary for understanding concerns arising in our technological society and the foundational tools for further study in science. FAST is designed for the heterogeneous classroom and has been found to be effective with both genders and diverse ethnic, socio-economic and ability student populations. FAST is aligned with National Research Council Standards and American Association for the Advancement of Science Benchmarks and adjustable to state standards. FAST recognizes teachers' needs for content, skills, and pedagogy instruction and requires teacher training.

Reach/Target Student Population:
In nearly 40 years, the FAST program has trained more than 5,000 teachers, using a cadre of 75 certified instructors in 36 states and 10
foreign countries. The number of students receiving a FAST experience is in the millions. The materials have been designed for all students in U.S. middle and intermediate schools. Student populations have included:
- those in predominantly urban and rural settings;
- high-ability and special-education students;
- high and low socio-economic groups;
- African-American, Hispanic, American Indian, Asiatic and Pacific Islander groups;
- males and females.

Future Scientists: Sowing the Seeds for Success

Program Overview:
Founded in 2004, the Future Scientists: Sowing the Seeds for Success program is designed to inspire students to continue their studies in science. It develops a collaborative research community between United States Department of Agriculture (USDA)/Agricultural Research Service (ARS) laboratories and their local communities and schools. It engages fourth through 12th grade teachers and students in hands-on, inquiry-based activities that are linked to current USDA/ARS research and adhere to the *National Science Education Standards*. The activities allow teachers, students and their parents to participate directly in cutting-edge research on an insect called the corn earworm. This pest, found all over the country, causes more than one billion dollars in damages and control expenses annually.

Reach/Target Student Population:
In the last three years, nearly 800 teachers and 66,620 students have participated in various Future Scientists programs at USDA/ARS laboratories in 20 states, including Arizona, New Mexico, Oklahoma, Texas, Arkansas, Colorado, Georgia, Indiana, Kansas, Kentucky, Louisiana, Maine, Minnesota, Missouri, Nebraska, New Jersey, Rhode Island, South Dakota, Tennessee and Wisconsin. The ethnic make-up of participating students is largely determined by the geographic location of the participating USDA/ARS labs. Over the last three years, the composition has been 42 percent Hispanic, 12 percent African-American and 46 percent Caucasian.

The Gateway Institute for Pre-College Education

Program Overview:
The Gateway Institute for Pre-College Education was established in New York City in 1986 to address the underrepresentation of minority students in medical schools and science- and mathematics-based careers. Gateway has established learning communities with 14 New York City public-high schools and also has partnered to create three of its own high schools. The interdisciplinary enriched curriculum prepares students for college with experiences and internships in medicine, engineering and other science-related fields. Gateway provides thousands of low-income and minority students the opportunity to prepare for college and careers. Based at the City University of New York, the Gateway program maximizes student achievement by:

• organizing student cohorts and teacher teams that work together in a planned four-year high school experience that features reduced class size and an extended instructional day and year to facilitate a rigorous interdisciplinary curriculum;
• designing and implementing support services that are managed by the teacher team to maximize student achievement and success;
• providing appropriate professional development for teachers;
• exposing students to many educational and cultural opportunities, both inside and outside the classroom, through enrichment programs offered by teachers and partners-including universities, museums, hospitals, research laboratories, corporations and other institutions; and,
• offering early college and career planning to help students identify summer placement and internship opportunities.

Reach/Target Student Population:
Currently, fourteen New York City public high schools have Gateway programs and there are three Gateway small schools (Queens Gateway to Health Sciences Secondary School, S.T.A.R. High School at Erasmus- in partnership with Brooklyn College and Gateway High School for Environmental Research and Technology). Gateway launched a program at the John D. O'Bryant School in Boston- in partnership with more than twenty research centers, hospitals and colleges. In total, Gateway works with more than 3,000 sixth through 12th-grade students and 200 teachers. Gateway students are Hispanic (23 percent), African-American (60 percent), Asian
(12 percent) and other (5 percent).

IMSA (The Illinois Math and Science Academy)

Program Overview:
The Illinois Math and Science Academy (IMSA) Excellence 2000+ (E2K+) outreach program offers after-school enrichment for late elementary and middle school students who are talented, interested and motivated in mathematics and science, placing special emphasis on students historically underrepresented and underserved in mathematics and science. By design, the E2K+ curriculum exemplifies IMSA's core expertise which centers upon competency-driven learning experiences
that are inquiry-based, problem-centered and integrative. The program serves primarily as a professional-development program for the mathematics and science teachers who deliver program curriculum to students in the after-school program.

Participating schools are provided not only with curricular materials, but also with a kit of lab materials for hands-on, minds-on activities for two units per school

year. E2K+ teachers acquire knowledge and skills that transfer into their regular classrooms and benefit all students. Ongoing site visits and support, and sessions for principals and parents are also provided to ensure success.

Reach/Target Student Population:
E2K+ has served more than 6,700 students since piloting the program in 2000. For the 2009-2010 school year, E2K+ is working with 176 teachers and 1,710 students with 74 programs in 61 Illinois schools. In helping to increase access to programming for students who are historically underrepresented in mathematics and science and for all areas of the state, when reviewing applications, preference is given to schools that serve African-American and Hispanic populations, as well as schools in rural areas.
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JETS (Junior Engineering Technical Society)

Program Overview:
Established in 1950, JETS (Junior Engineering Technical Society) is the leading nonprofit educational organization dedicated to promoting engineering and technology careers to America's youth. From creating the only student assessment tool strictly for engineering to developing top competitions that paint a real-world picture of the profession, JETS' successful ventures have provided multiple pathways for students to discover their potential for engineering. Specifically, JETS' major program components include:

EXPLORE
• The Pre-Engineering Times: a free monthly e-newsletter highlighting exciting, real-world experiences and people in engineering;
• Explore magazine: JETS' newest publication that helps students discover engineering;
• Jets.org/explore: the ultimate online resource covering more than 20 careers in engineering;

ASSESS
• PathAssess™: an online tool showing students how their unique interests and skills can align with certain majors and careers in engineering;

EXPERIENCE
• TEAMS: a written competition for students highlighting the "Grand Challenges" identified by the National Academy of Engineering;

• National Engineering Design Challenge (NEDC): a hands-on design challenge in which students make a direct impact in their community by improving the lives of people with disabilities;

• UNITE: a summer program designed to prepare and motivate minority students for success in engineering through advanced
academic classes.

Reach/Target Student Population:
JETS' programs directly impact a national audience of more than 40,000 students and 10,000 educators in 6,000 high schools each year. JETS' reach is extended to more than 200,000 students through the distribution of its career exploration materials and free electronic newsletter. JETS' participants are a diverse group – more than 50 percent are from groups that are traditionally underrepresented in the engineering and technology fields, including one-third who are female.

Kinetic City

Program Overview:
Kinetic City is an innovative, award-winning series of after-school learning programs produced by the American Association for the Advancement of Science (AAAS). The mission of Kinetic City is to reach students who may have little interest in science, get them excited about it and engage them in standards-based learning activities. The goal is to produce students
who are science literate and "ready to learn" in school. Some programs include:

• *Kinetic City: Mission to Vearth* - In this program, children race to save the virtual Earth, or Vearth, from science-destroying computer viruses. It combines online computer-based games and simulations with hands-on science activities, physical education challenges, art projects and creative-writing activities. As they complete their missions, students keep research journals, score points in their online account and receive collectible trading cards. *Kinetic City: Mission to Vearth* won the Codie Award for Best Elementary Education program.

• *Kinetic City Science Gym* - This eight-week program combines standards-based science and health and physical education content-teaching children about the human body, nutrition and exercise.

• *Kinetic City Spark Club* (Spring 2010) - This eight-week after-school program teaches students about energy sources and culminates in a team project in which children work with engineering college students to complete a community energy demonstration project.

Reach/Target Student Population:
Kinetic City's target population is upper elementary and middle school students, ages nine-to-12 years old, participating outside of regular school hours at community learning centers, school-based programs, Boys and Girls Clubs, YMCAs and other out-of-school venues. More than 31,000 students currently participate in Kinetic City as registered users. Approximately 1,500 of those are participating through official Kinetic City After School Clubs at 50 sites around the country. Hispanic and African-American students comprise a large portion (more than half) of Kinetic City's members.

An Inventory of Stem Programs and Best Practices-At a Glance

	NAME	PROGRAMATIC FOCUS	TARGET / REACH POPULATION	
	Engineering is Elementary	**Promotes engineering and technological literacy**	**1st-5th grade; 15,500 elementary school teachers; 1,000,000 students; 1,300 schools**	
	Project SEED	**Focuses on scientific research**	**High school students from economically disadvantaged background; 400 students annually; Over 100 institutions; 300 volunteer scientist mentors**	
	ASSET Inc.	**Provides teachers with professional development and a hands-on curriculum**	**Teachers; K-8 students; 180 school districts; 5,000 teachers; 142,000 students across Pennsylvania**	
	Biotech Partners	**School-to-career partnership focusing on the sciences**	**150 students at Berkeley High School, Oakland Technical and Peralta Community College District; Nearly all 97%-students of color; 53% young women**	
	Breakthrough Collaborative	**Focuses on college-preparatory science and math**	**In 2009, - 2,440 middle school students were served, 2,998 high school students and 723 college students. 91 % - students of color; 68 % qualify for free or reduced-price lunch; 39 % speak English as a second language**	

	Community Resources for Science (CRS)	**Focuses on science**	**Elementary school students in urban districts;** **37%-African Americans;** **22% Hispanic;** **10% Asian**	
	Detroit Area Pre-College Engineering Program (DAPCEP)	**Focuses on engineering and technology**	**5,000 K-12 students annually;** **Primarily African-American and Hispanic;** **70 %- residents of the City of Detroit;** **50 % female;** **30 % median household income at or below poverty**	
	Developmental Approaches in Science, Health and Technology (DASH)	**Focuses on research, science and technology**	**Trained more than 11,000 teachers - using 175 certified trainers in 26 states;** **K-6 students in public and private schools;** **Urban and rural areas;** **High and low socio-economic groups**	
	The Environment as a Context for Opportunities in School (ECOS)	**Focuses on science**	**K-5 students in 11 elementary schools;** **3,500 students (under- represented groups);** **140 teachers**	
	EQUALS	**Focuses on mathematics**	**Nationwide and international: Teacher training sites in 65 school districts- in 34 states and at nine international locations on five continents (tens of thousands of pre-K-12 students each year- bilingual and low income)**	

	Family Math and Matematica Para La Familia	**Focuses on mathematics**	**K-8 students and their families (traditionally underserved groups)**	
	Full Option Science System (FOSS)	**Focuses on science**	**More than 100,000 teachers and two million K-8 students participating in approximately 16 % of the nation's school districts**	
	Foundational Approaches in Science Teaching (FAST)	**Focuses on science**	**Over 5,000 teachers - in 36 states and 10 foreign countries (middle and intermediate school students- African-American, Hispanic, American Indian, Asiatic and Pacific Islander groups, males and females)**	
	Future Scientists: Sowing the Seeds for Success	**Focuses on science**	**In the last three years, nearly 800 teachers and 66,620 students have participated in various Future Scientists programs at USDA/ARS laboratories in 20 states - 42 % Hispanic, 12 % African-American and 46 % Caucasian**	
	The Gateway Institute for Pre-College Education	**Focuses on science and mathematics**	**More than 3,000 6th- 12th grade students and 200 teachers; Students are Hispanic (23 %), African-American (60 %), Asian (12%) and other (5%)**	
	The Illinois Math and Science Academy (IMSA)	**Focuses on science and mathematics**	**More than 6,700 students from underrepresented groups served since piloting the program in 2000; For the 2009-2010 school year- worked with 176 teachers and 1,710 students with 74 programs in 61 Illinois schools**	

	Junior Engineering Technical Society (JETS)	**Focuses on engineering and technology**	**JETS' programs directly impact a national audience of more than 40,000 students and 10,000 educators in 6,000 high schools each year (more than 50% -from traditionally underrepresented groups in the engineering and technology fields, including one-third who are female)**	
	Kinetic City	**Focuses on science**	**Upper elementary and middle school students, ages nine-to-12 years old- participating outside of regular school hours;** **More than 31,000 students currently participate in Kinetic City as registered users (Hispanic and African-American students comprise a large portion of the group)**	

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