InfoBrief
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Regional Concentrations of Scientists and Engineers in the United States

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Science and engineering (S&E) employment in the United States is geographically concentrated in a small number of states and several major metropolitan areas within those states, according to data from the U.S. Census Bureau's 2011 American Community Survey (ACS). The three most populous states—California, Texas, and New York—together accounted for more than one-fourth of all S&E employment in the United States. Several major metropolitan areas in those states, for example, areas around Santa Clara, Los Angeles, and San Diego, all in California, and areas around New York City and Houston, together accounted for approximately 1 in 10 S&E workers nationwide.[2]

The availability of a skilled workforce is an important predictor of a region's population, productivity, and technological growth.[3] Workers with S&E expertise are an integral part of a region's innovative capacity because of their high levels of skill, creative ideas, and contributions to scientific knowledge and R&D.

National and State Patterns

In 2011, about 5.7 million workers were employed in S&E occupations across the United States, according to the ACS. Almost three-fourths of these S&E workers had a college or higher degree. A total of 3.1 million S&E workers reported being in a computer or mathematical sciences occupation, and 1.7 million reported being engineers. The rest were in biological, agricultural, and environmental life sciences (life sciences) (259,000), physical sciences (368,000), and social sciences (285,000).

S&E employment is consolidated in a few states. Nationally, one out of two individuals employed in an S&E occupation worked in the nine states with the largest S&E employment. The three most populous states—California, Texas, and New York—had the largest S&E employment and together accounted for more than one-fourth of all S&E employment in the United States (table 1). Florida, Virginia, Pennsylvania, Illinois, Massachusetts, and Ohio together accounted for nearly another one-fourth of nationwide S&E employment (table 1).

The intensity of S&E employment—the proportion of workers in a state employed in S&E jobs—is another measure of the regional concentration of S&E jobs. At the state level, S&E employment intensity was highest in the District of Columbia, followed by Maryland and then by the four states: Massachusetts, Virginia, Colorado, and Washington (table 1). The three most populous states—California, Texas, and New York—despite accounting for one in four S&E workers in the nation, had lower shares of their employed population in S&E occupations. Most states had a lower S&E employment intensity than the United States as a whole (table 1).

Local Patterns

A number of local areas with significant numbers of S&E workers were within the states with the largest S&E employment. The two local areas with the largest S&E employment were in California—the areas in the vicinity of Santa Clara in Northern California and Los Angeles in Southern California (table 2). The areas around New York City, Houston, Denver, and San Diego had the next largest levels of S&E employment. Together, these six areas accounted for 13% of employed S&E workers across the United States.

Computer and mathematical sciences occupations were abundant in the areas with high levels of S&E employment, especially in the areas around New York City; Santa Clara, California;

TABLE 1. Employment in S&E occupations, share of nationwide S&E employment, and intensity of S&E employment, by state: 2011

State	S&E employment		S&E employment in state		S&E employment intensity[a]	
	Number	Standard error	Percent	Standard error	Percent	Standard error
United States	5,677,410	37,585	100.0	-	4.1	0.03
Alabama	57,541	3,796	1.0	0.09	3.0	0.20
Alaska	15,579	1,720	0.3	0.08	4.3	0.47
Arizona	105,066	5,118	1.9	0.09	4.0	0.19
Arkansas	23,668	2,287	0.4	0.09	2.0	0.19
California	786,653	13,972	13.9	0.23	4.9	0.09
Colorado	149,632	6,067	2.6	0.11	6.1	0.24
Connecticut	79,910	4,450	1.4	0.09	4.6	0.26
Delaware	18,999	2,036	0.3	0.09	4.7	0.50
District of Columbia	85,624	4,324	1.5	0.09	10.7	0.55
Florida	235,054	7,671	4.1	0.13	3.0	0.10
Georgia	158,666	6,290	2.8	0.11	3.8	0.15
Hawaii	23,278	2,408	0.4	0.09	3.6	0.36
Idaho	26,622	2,415	0.5	0.09	4.1	0.36
Illinois	215,554	7,329	3.8	0.13	3.7	0.13
Indiana	85,159	4,327	1.5	0.09	3.0	0.15
Iowa	44,359	2,704	0.8	0.08	2.9	0.18
Kansas	50,987	3,117	0.9	0.08	3.7	0.22
Kentucky	48,273	3,478	0.9	0.09	2.6	0.19
Louisiana	42,607	3,271	0.8	0.09	2.2	0.17
Maine	19,581	1,935	0.3	0.08	3.2	0.31
Maryland	180,415	6,656	3.2	0.12	7.0	0.25
Massachusetts	209,321	7,167	3.7	0.13	6.4	0.22
Michigan	172,831	5,740	3.0	0.10	4.3	0.14
Minnesota	125,757	4,533	2.2	0.08	4.6	0.17
Mississippi	19,399	2,210	0.3	0.09	1.7	0.21
Missouri	96,563	4,907	1.7	0.09	3.5	0.18
Montana	13,739	1,621	0.2	0.08	2.9	0.34
Nebraska	30,596	2,244	0.5	0.08	3.2	0.23
Nevada	28,789	2,687	0.5	0.09	2.4	0.22
New Hampshire	30,076	2,559	0.5	0.09	4.8	0.40
New Jersey	182,146	6,724	3.2	0.12	4.8	0.17
New Mexico	37,605	3,059	0.7	0.09	4.4	0.35
New York	328,851	9,052	5.8	0.16	3.6	0.10
North Carolina	154,387	6,205	2.7	0.11	3.7	0.15
North Dakota	9,195	1,137	0.2	0.07	2.4	0.29
Ohio	193,623	6,512	3.4	0.11	3.8	0.13
Oklahoma	48,257	3,258	0.8	0.09	2.9	0.20
Oregon	75,788	4,340	1.3	0.09	4.4	0.25
Pennsylvania	224,196	7,004	3.9	0.12	3.9	0.12
Rhode Island	19,717	2,214	0.3	0.09	4.1	0.45
South Carolina	53,261	3,653	0.9	0.09	2.8	0.19
South Dakota	8,817	1,301	0.2	0.08	2.2	0.32
Tennessee	84,197	4,589	1.5	0.09	3.0	0.16
Texas	450,316	10,589	7.9	0.18	4.0	0.09
Utah	57,043	3,528	1.0	0.09	4.6	0.28
Vermont	11,108	1,247	0.2	0.07	3.5	0.39
Virginia	234,067	7,590	4.1	0.13	6.2	0.20
Washington	187,362	6,796	3.3	0.12	6.1	0.22
West Virginia	19,051	2,049	0.3	0.09	2.7	0.28
Wisconsin	100,219	4,059	1.8	0.08	3.7	0.15
Wyoming	6,759	1,138	0.1	0.08	2.3	0.38

S&E = science and engineering.

[a] Intensity of S&E employment in a state is defined as the percentage of all workers in that state employed in S&E occupations.

NOTES: Differences in employment estimates between any two states may not be statistically significant. State-level data may not add to U.S. total since some employed individuals reported a foreign country as place of work.

SOURCE: Census Bureau, American Community Survey public use microdata sample files, 2011.

TABLE 2. Employment in science and engineering occupations, by PUMA: 2011

S&E occupation and general geographic location[a]	Place of work PUMA and state indicator[a]	S&E employment		S&E employment in geographic area	
		Number	Standard error	Percent	Standard error
All S&E					
United States	-	5,677,410	37,585	100.0	-
Santa Clara, CA	2700, 06	143,329	5,783	2.5	0.10
Los Angeles, CA	4890, 06	141,719	5,940	2.5	0.10
New York, NY	3800, 36	121,590	5,336	2.1	0.10
Houston, TX	4690, 48	118,263	5,394	2.1	0.10
Denver, CO	0800, 08	99,247	4,927	1.7	0.09
San Diego, CA	8100, 06	91,288	4,740	1.6	0.09
Biological, agricultural, and environmental life sciences					
United States	-	258,646	8,093	100.0	-
Boston, MA[b]	3300, 25	8,213	1,433	3.2	0.55
Montgomery County, MD	1000, 24	8,064	1,424	3.1	0.54
New York, NY	3800, 36	6,667	1,297	2.6	0.50
San Diego County, CA	8100, 06	6,600	1,292	2.6	0.49
Los Angeles, CA	4890, 06	6,212	1,254	2.4	0.48
Computer and mathematical sciences					
United States	-	3,057,688	27,701	100.0	-
New York, NY	3800, 36	78,747	4,356	2.6	0.14
Santa Clara, CA	2700, 06	77,576	4,338	2.5	0.14
Los Angeles, LA	4890, 06	73,806	4,305	2.4	0.14
Denver, CO	0800, 08	59,788	3,852	2.0	0.13
Fairfax County, VA	0300, 51	57,364	3,715	1.9	0.13
District of Columbia	0100, 11	56,427	3,605	1.8	0.13
Houston, TX	4690, 48	53,598	3,661	1.8	0.13
Physical sciences					
United States	-	368,304	9,656	100.0	-
Los Angeles, LA	4890, 06	9,306	1,535	2.5	0.41
Denver, CO	0800, 08	9,093	1,516	2.5	0.41
Boston, MA[b]	3200, 25	7,992	1,369	2.2	0.38
Houston, TX	4690, 48	7,874	1,411	2.1	0.38
San Diego, CA	8100, 06	7,330	1,361	2.0	0.37
Santa Clara, CA	2700, 06	6,942	1,324	1.9	0.37
Oakland, CA	2400, 06	6,518	1,283	1.8	0.37
Montgomery County, MD	1000, 24	6,238	1,253	1.7	0.37
Social sciences					
United States	-	285,219	8,498	100.0	-
District of Columbia	0100, 11	13,697	1,842	4.8	0.64
Los Angeles, CA	4890, 06	12,560	1,783	4.4	0.61
New York, NY	3800, 36	10,595	1,633	3.7	0.56
Engineering					
United States	-	1,707,553	20,746	100.0	-
Santa Clara, CA	2700, 06	53,129	3,615	3.1	0.21
Houston, TX	4690, 48	51,294	3,583	3.0	0.21
Los Angeles, CA	4890, 06	39,835	3,169	2.3	0.18
San Diego, CA	8100, 06	29,887	2,739	1.8	0.17

PUMA = public use microdata area; S&E = science and engineering.

[a] For information about the specific location of the place of work PUMA, see http://usa.ipums.org/usa/volii/00pwpuma.shtml#5percent and the PUMA maps available at http://www.census.gov/geo/maps-data/maps/reference.html.

[b] In Massachusetts, employment PUMA 3200 covers part of Middlesex County and employment PUMA 3300 covers part of Suffolk County. Both areas are located in the vicinity of Boston.

NOTE: Differences in employment estimates between any two individual areas may not be statistically significant.

SOURCE: Census Bureau, American Community Survey public use microdata sample files, 2011.

and Los Angeles. Large numbers of computer and mathematical scientists were also found in areas in the vicinity of Denver; Fairfax County, Virginia; the District of Columbia; and Houston. These seven areas together accounted for 15% of approximately 3 million workers employed in computer and mathematical sciences occupations nationwide (table 2).

Some of the areas with high levels of computer and mathematical sciences occupations also had large numbers of engineers—for example, areas in the vicinity of Santa Clara, California, and Houston, followed by the area surrounding Los Angeles. The area around San Diego was another location with one of the highest levels of employment in engineering. Together, these four areas accounted for 10% of approximately 2 million engineers nationwide (table 2).

Some of the areas with large numbers of computer and mathematical sciences occupations or engineering occupations also had substantial numbers of employees in other types of S&E occupations, namely life sciences, physical sciences, and social sciences. For example, the areas surrounding New York City, San Diego, and Los Angeles employed large numbers of life scientists in addition to large numbers of engineers or computer and mathematical scientists. The vicinities of Boston and Montgomery County, Maryland were examples of two other areas with large numbers of life scientists. Together, these five areas employed 14% of the 259,000 workers in life sciences occupations (table 2).

High levels of employment in the physical sciences were found in areas in the vicinity of Los Angeles, San Diego, Santa Clara, and Oakland, all in California, as well as in Denver, Boston, Houston, and Montgomery County, Maryland. Some of these areas also employed large numbers of workers in other S&E occupations. About 61,000 workers employed in physical sciences occupations (17% of the nationwide total of 368,000) reported working in these eight areas (table 2).

Social sciences occupations were concentrated in the District of Columbia, Los Angeles, and New York City. These three areas employed 13% of the 285,000 social scientists in the nation (table 2).

Data Source

The ACS is an ongoing nationwide sample survey conducted by the U.S. Census Bureau (https://www.census.gov/acs/www/). The ACS gathers demographic, social, economic, employment, and housing data for the nation, states, and localities within states. The data presented in this report are based on the 2011 ACS public use microdata sample (PUMS) files.

This InfoBrief uses information from the ACS on an individual's employment location and occupation to estimate the total number of workers in S&E occupations by geography. S&E employment includes people who work in occupations that the National Science Foundation (NSF) designates as S&E occupations. Broadly, these include biological, agricultural, and environmental life sciences occupations; computer and mathematical sciences occupations; physical sciences occupations; social sciences occupations; and engineering occupations. NSF also categorizes S&E postsecondary teachers as being in S&E occupations. However, because the ACS public use data do not allow for separate identification of S&E postsecondary teachers, members of this group are not included in the analysis presented here. According to NSF's Scientists and Engineers Statistical Data System (SESTAT), S&E postsecondary teachers accounted for about 8% of all S&E occupations in 2010. Health occupations, S&E managers, and S&E technicians are not included in the analysis presented here.

The ACS gathers occupation information for employed individuals who are currently working as well as for employed individuals "with a job but not at work," that is, those who were temporarily absent from their jobs in the survey reference week because of illness, bad weather, industrial dispute, vacation, or other personal reasons. Information on place of work, however, is provided only for those who were working and not for those who were temporarily absent from their job during the survey reference week. Thus, this report focuses on the first group of employed S&E workers who account for nearly (99%) all workers employed in S&E occupations.

The ACS provides local employment information pertinent to work locations of employed individuals in two levels of geographic detail: at the state level for broad geographic patterns and in areas within a state for more local and detailed patterns. An area within a state is called a public use microdata area (PUMA). PUMAs are generally constructed based on minor civil divisions, places, towns, counties or other geographic types within states, and they contain a population of at least 100,000. An employment or place of work PUMA (POWPUMA) may cover an entire county or part of one or more counties within a state.

In order to describe the POWPUMAs as recognizable geographical areas, this InfoBrief refers to the general geographic locations of these POWPUMAs. For example, POWPUMA 4690 in the state of Texas spans part of Harris County located around the Houston area. This InfoBrief refers to this particular POWPUMA as "area in the vicinity of" or "area

around" Houston. The data table provides the ACS numeric code for the POWPUMA and state for exact identification of the geographic location. The report uses the term "area" to refer to POWPUMA of employed individuals.

For data presentation purposes, the District of Columbia is treated both as a state and a POWPUMA.

All comparative statements in this report have been tested for statistical significance, and comparisons are statistically significant at the 90% level.

Notes

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2. A report from the National Center for Science and Engineering Statistics, using data from the 2008 Business R&D and Innovation Survey (BRDIS), found that businesses in the United States concentrate their R&D in a small number of metropolitan areas. San Jose-San Francisco-Oakland combined statistical area (CSA) in the state of California and the New York-Newark-Bridgeport CSA spanning the states of New York, Connecticut, Pennsylvania, and New Jersey were two of the largest R&D locations of U.S. businesses with high levels of R&D expenditure. See Shackelford B. 2012. *Businesses Concentrate Their R&D in a Small Number of Geographic Areas in the United States*. InfoBrief NSF 12-326. Arlington: VA. Available at http://www.nsf.gov/statistics/infbrief/nsf12326/.

3. Glaeser EL, Saiz A. 2003. *The Rise of the Skilled City*. NBER working paper 10191. Cambridge, MA: National Bureau of Economic Research.

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