The
Burtch
Works
Study

Salaries of Data Scientists

April 2016

Burtch Works Executive Recruiting
Linda Burtch, Managing Director

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Section 1

INTRODUCTION

The Data Science Market: Where We Are

2016 marks the third consecutive year that Burtch Works has published *The Burtch Works Study: Salaries of Data Scientists*, about the "elusive kingpins of the Big Data movement". The enthusiasm for data-driven strategy has continued to increase since our initial study in 2014, and readers of this report are likely well familiar with some of the effects this has had on the quantitative hiring market.

We've seen a number of interesting use cases for data science in an increasing variety of industries. Internet of Things industrial applications have emerged, which can involve using sensor data to develop predictive maintenance capabilities to anticipate equipment failure. In entertainment, casinos use real-time customer data to build and optimize their loyalty programs, and video game companies track player behavior to improve engagement as well as develop future offerings. In the behavioral health area, data science applications can be used to personalize medical treatment, coordinate prescriptions, and monitor for changes in behavior. And, of course, the ability to use data science to personalize advertising continues to offer copious benefits for marketing teams.

One side effect, however, of this marked increase in data science use cases is the near-ubiquitous use of the "data scientist" title. The overwhelming popularity of the title and the newness of the discipline have resulted in the term appearing on a myriad of job descriptions, resumes, and LinkedIn profiles, whether or not the role or professional possesses the full range of data science skills. Examples of relevant skills might include implementing machine learning algorithms, wrangling unstructured data, or using tools like Hadoop, among others. To learn more about what backgrounds, skills, job responsibilities, and data experience we look for when categorizing data scientists for this report, as well as more details about which professionals are not included in the study, turn to **Identifying Data Scientists** on page 32.

On the recruiting front, a constant refrain from clients has been the struggle to find data scientists who can balance their strong technical skills with the business acumen and domain knowledge needed to make an impact on business goals. The ability to glean information from massive datasets and then translate how those insights become actionable for the business has always been important, but is even *more* so now that leaders are looking to capitalize on the value of their data and demonstrate a return on their investment.

With all of the attention that data science has received, students have been flooding into the field. Degree and enrollment trends show increases in statistics, mathematics, computer science, and engineering graduates[1-4] – all top educational backgrounds for data scientists – and students can't wait to get to work, as evidenced by the increase in the percentage of professionals with Master's degrees (as opposed to Ph.D.'s) at the entry-level (refer to p. 21 for more details). Additionally, there are many professionals looking to transition into the field from other career paths.

With some of the hype beginning to give way to a more "business as usual" attitude, these next few years will be a proving ground for newly forged data science teams, Master's programs, bootcamps, startups, and for new and established data scientists. Learn more about Burtch Works' predictions for data science in **The Data Science Market: Where We're Going** on page 6.

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[1] Statistics degrees continue strong growth. *Amstat News.* October 1, 2015.
[2] Expand career options with a graduate degree in math. *U.S. News & World Report.* October 8, 2015.
[3] More students earning STEM degrees, report shows. *U.S. News & World Report.* January 27, 2015.
[4] The STEM enrollment boom. *Inside Higher Ed.* April 7, 2014.

The Data Science Market: This Year's Compensation Insights

Burtch Works is pleased to share the annual update to our highly regarded data science salary report series. Complete compensation and demographic data on 374 data scientists is detailed in this year's report, *The Burtch Works Study: Salaries of Data Scientists April 2016*. This new set of data was collected by our recruiting staff during the 12 months ending March 2016.

This report includes salary information for data scientists, including how salaries have changed since the last study was published in April 2015, for both individual contributors and managers. Salary data include the distribution of base salaries (quartiles and means), as well as the proportions eligible for bonus compensation along with median and mean bonuses received. Demographic characteristics are also reported, which include education, region, industry, gender, residency status, years of experience, and job category, along with how data scientist base salaries vary by these characteristics.

Sixty-nine percent of this sample consists of individual contributors, whose median base salaries range from $97,000 at level 1 to $152,000 at level 3. Over 73% of all individual contributors are eligible for bonuses, and the median bonus they received range from $10,000 to $21,000, depending on level (see pp. 14-15).

Managers comprise the remaining 31% of this year's sample. Median base salaries for managers range from $140,000 at level 1, to $240,000 at level 3. At every level, more than 80% of managers are eligible to receive bonus compensation, with median bonuses received ranging from $15,000 to $80,000 (see pp. 14-15).

When comparing salaries over time, individual contributors within data science saw base salary increases at level 1 (+7%) and level 3 (+1%), while salaries remained steady at level 2. For managers, salaries at level 1 remained steady while those at level 2 increased (+3%). At level 3, the median base salary decreased by 4% ($10,000) (see pp. 10-12).

Data scientists continue to out-earn other predictive analytics professionals. Comparing this report's data to our September 2015 report for the predictive analytics market, data scientists earn base salaries up to 39% higher than other predictive analytics professionals depending on job category. Data scientists see double-digit advantages at five out of six job categories (see pp. 16-17).

Our data point to a shift in the educational background of data scientists. In this year's sample, 59% of level 1 individual contributors' highest degree is a Master's, a significant increase from last year's 48%. This increase in Master's degree holders is counteracted by a decrease in Ph.D.'s: 28% of this year's level 1 individual contributors vs. 43% in 2015 (see p. 21). As alternatives to traditional academic routes (such as Massive Open Online Courses (MOOCs) and bootcamps) become more commonplace, it appears that data scientists are opting for a faster route to the workplace.

Another apparent result of this changing educational landscape is an increase in the number of U.S. citizens in the data science talent pool. Overall, 69% of this year's sample is composed of citizens, compared to 64% last year. The most dramatic change was seen among level 1 individual contributors, where only 43% of this year's professionals are foreign-born vs. 53% last year (see p. 27). In a field which is typically flush with many foreign-born professionals, attracted by STEM

education and the OPT visa extension program, it appears that American-born students are noticeably rising in number within the data science market, perhaps looking for a route to a high-paying career.

The Data Science Market: Where We're Going

The evolution of data science, the maturation of data scientists, and the disruption taking place in many of the industries in which they work all raise the question – where do we go from here? From our vantage point at the intersection of data scientists' perspectives and organizations' hiring needs, there are several trends that we foresee taking shape over the next few years.

One interesting trend is the shift, which has begun to take place in our conversations with many data scientists, from a desire to work for bigger, "name brand" companies like Facebook or Google, to more mission-driven organizations attempting to make an impact on society. Although the massive data science teams at FANG (Facebook, Amazon, Netflix, and Google) and others continue to attract top-notch talent, there has been a noticeable segment of data scientists leaving or avoiding companies like this in order to build something new, or in hopes of contributing to something that they feel is more meaningful. Whether it is curing cancer, conserving energy, tracking infectious diseases, or personalizing education, more data scientists are becoming interested in trying to make the world a better place.

Another trend that has started to coalesce over the past few months, and which we anticipate will continue to take shape, has been the increasing pressure on many startups to show their value. Over the past three to four years, many data scientists have chosen to work for startups, but as some have already been through the startup cycle once (or even twice), many are now looking for something with more stability. If a startup struggles to meet investors' expectations – either because it's not profitable, can't scale, or both – this can spell trouble for some teams, and in turn for the data scientists they employ. Lately there have been whisperings of overvaluation, since the number of unicorn startups valued over $1 billion has increased from 45 to 146 companies worldwide over the past two years[5]. If there are storm clouds on the horizon, it will have a noticeable effect on the data science hiring market.

In addition to industries where the use of data science is more established, there are other industries like fintech, healthcare, and transportation where data science as a discipline is young and growing. Companies in consumer lending are refining how to assess creditworthiness using non-traditional factors like social media networks. Healthcare startups are using data science to move ever-closer to personalized medicine and using artificial intelligence to examine images like x-rays and MRIs to diagnose problems quickly and accurately. In transportation, traffic management agencies are able to use real-time traffic and weather data to predict traffic flows and manage emergency response. As the utilization of data science in these industries matures, no doubt we will see even more new applications for it.

An issue that has continued to plague companies in every industry has been the dearth of experienced data science talent available to adequately embark on all of these new projects. Whether in advertising, life sciences, government, cybersecurity, insurance, technology, or finance, all have struggled to find talent beyond the entry level. Demand for data scientists has been increasing as more organizations jump on board the "data bandwagon", and while the supply has

[5] The billion dollar startup club. *The Wall Street Journal.* February 18, 2015.

been improving, it still lags far behind. Luckily, more educational options – including new Master's degrees, MOOCs, and bootcamps – have sprung up to try and meet this need. We're already seeing an increase in the percentage of professionals with Master's degrees (as opposed to Ph.D.'s) at the junior level, and educational backgrounds will continue to diversify as more students and professionals look to capitalize on the hot market. Some companies, like Airbnb, are even hosting internal bootcamps, opting to "make rather than buy".

As one might imagine, all of these factors combined will lead to a lot of changes over the next few years. The use of data science will become more ubiquitous, the talent supply will improve, and there will be even more use cases for these techniques, reaching far beyond the few examples of current uses that we've briefly mentioned. Consider this report a glimpse into the future of where the discipline might be headed, and no doubt next year we'll have even more news from the front.

About Burtch Works

Founded by Linda Burtch, Burtch Works Executive Recruiting is the premier resource for quantitative talent, job opportunities, and information about hiring and compensation trends. Our team of recruiters has over 90 years of collective experience in their quantitative specialties, which include data science, quantitative business analytics, web analytics, credit/risk analytics, marketing research, and many more. These specializations allow Burtch Works recruiters to closely follow the talent movement and hiring trends unique to each area, as well as to understand the subtle nuances of their area of expertise, which leads to longstanding client and candidate relationships.

As data-driven initiatives have become increasingly common over the past few years, Burtch Works recruiters have continued to carefully build networks of exceptionally qualified individuals within every analytics specialty. Our long-standing relationships with over 25,000 quantitative professionals, as well as clients in every industry, have allowed us to view hiring and compensation trends in these areas from a very unique position. We have kept in touch with thousands of these professionals for many years, starting with the completion of their graduate degree programs and continuing even as they move into senior leadership positions.

Over her 30+ years of recruiting in quantitative disciplines, Linda Burtch has developed an especially comprehensive understanding of the analytics fields, including the evolving field of data science. She has maintained a blog on quantitative hiring trends for almost ten years, and has been interviewed for her insights on the data science and analytics talent market by The New York Times, The Wall Street Journal, CNBC, Mashable, Forbes, The Chicago Tribune, Fox News, All Analytics, Analytics Magazine, InformationWeek, and many more.

Data scientists – the "four leaf clovers" of the analytics world – have given our *Burtch Works Studies* an unprecedented view of this growing profession, and we owe our sincerest thanks to all the data scientists who supplied their compensation, demographic, and job characteristics, and who allow us to put together these reports. Whether being utilized by a manager hiring for their team, or by a professional developing benchmarks for their career, our salary reports are an essential insight into the job market and salary trends in the predictive analytics, marketing research, and data science fields.

Section 2

DATA SCIENTISTS:
HOW COMPENSATION HAS CHANGED

The Sample

This sample contains 374 of the more than 2,200 data scientists with whom Burtch Works maintains contact. Burtch Works collected the data for this study in interviews conducted over the 12 months ending March 2016, which is the year immediately following the period of interviews for the 2015 study. Professionals were included in the sample only if (1) they satisfied Burtch Works' criteria for data scientists, and (2) Burtch Works obtained complete information about that individual's compensation, demographic, and job characteristics.

How Changes in Compensation Were Measured

While some of the 374 data scientists in this sample were also in the samples for our previous studies (published in 2014 and 2015), others were not. Therefore, changes in compensation were not measured by differencing current compensation and compensation reported for the previous study and then taking medians (and other percentiles) of the differences. Instead, changes were measured by comparing medians (and other percentiles) of current compensation to those reported in last year's study.

Changes in Base Salaries

- This year's data suggests that data science salaries appear to be leveling off: every job category except one (level 1 individual contributors) experienced a marginal single-digit shift in median base salary over the past year.

- While this year's increase has did not match last year's 14%, the largest increase was again seen among level 1 individual contributors, for whom the median base salary increased by 7%.

- Managers at level 3 showed a 4% decrease in median base salary, from $250,000 last year to $240,000 this year. The 25th percentile, however, increased by 12%, from $202,500 last year to $226,250 this year, suggesting an overall positive trend in executive-level salaries.

Figure 1. *Comparison of Data Scientists' Median Base Salaries by Job Category*
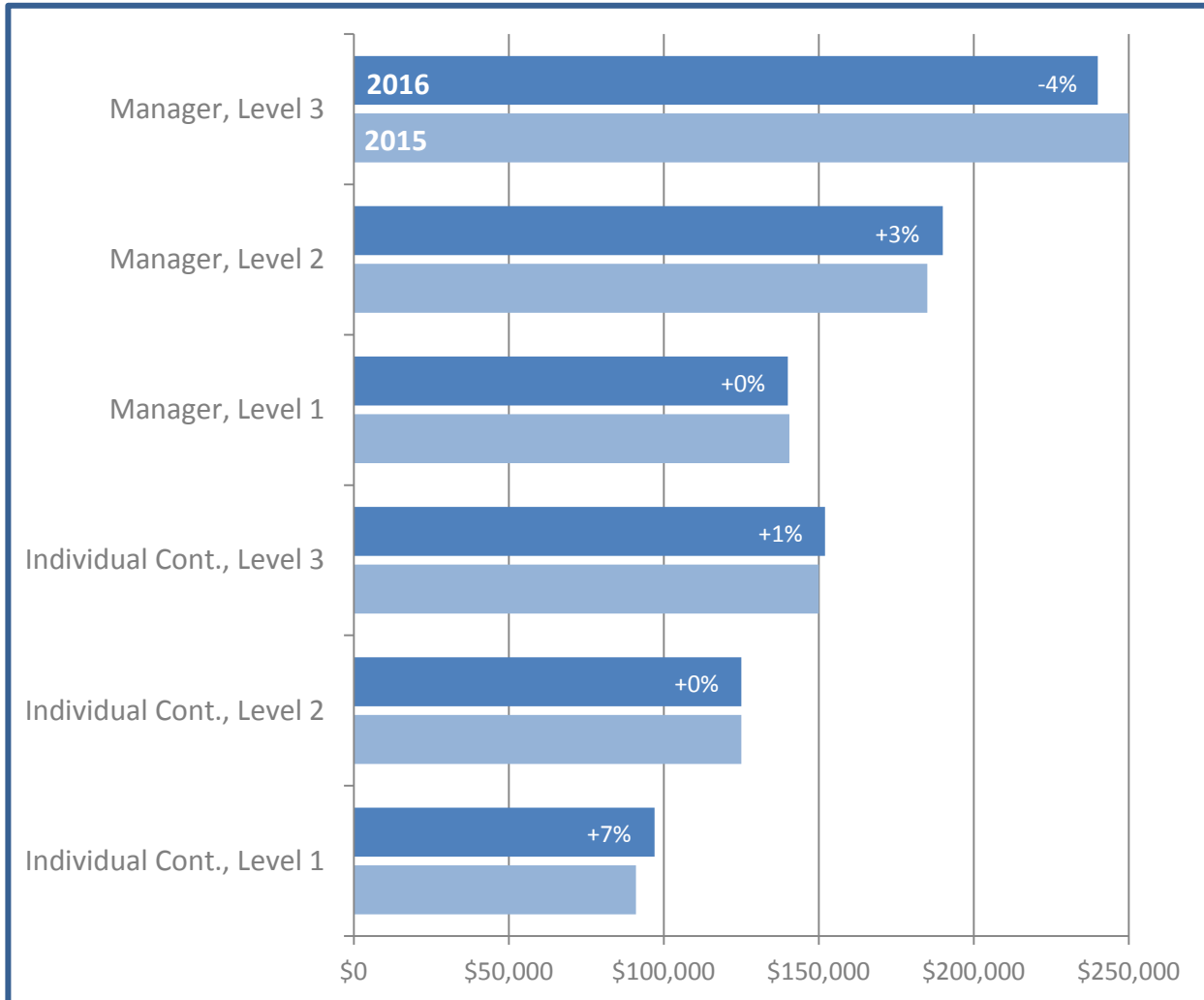

	2016	2015
Manager, Level 3	-4%	
Manager, Level 2	+3%	
Manager, Level 1	+0%	
Individual Cont., Level 3	+1%	
Individual Cont., Level 2	+0%	
Individual Cont., Level 1	+7%	

Figure 2. Change in Base Salaries of Data Science Individual Contributors by Job Level

Job Level	Year	25%	Median	75%
Individual Contributor, Level 1	2016	$85,000	$97,000	$105,000
	2015	$75,000	$91,000	$110,000
	Change	13%	7%	-5%
Individual Contributor, Level 2	2016	$115,000	$125,000	$140,000
	2015	$104,500	$125,000	$140,000
	Change	10%	0%	0%
Individual Contributor, Level 3	2016	$141,500	$152,000	$175,000
	2015	$132,000	$150,000	$175,000
	Change	7%	1%	0%

Figure 3. Change in Base Salaries of Data Science Managers by Job Level

Job Level	Year	25%	Median	75%
Manager, Level 1	2016	$125,000	$140,000	$150,000
	2015	$130,000	$140,500	$153,750
	Change	-4%	0%	-2%
Manager, Level 2	2016	$180,000	$190,000	$200,000
	2015	$160,000	$185,000	$206,000
	Change	13%	3%	-3%
Manager, Level 3	2016	$226,250	$240,000	$277,750
	2015	$202,500	$250,000	$283,500
	Change	12%	-4%	-2%

Section 3

DATA SCIENTISTS: DEMOGRAPHIC PROFILE & CURRENT COMPENSATION

Compensation by Job Category

- The majority of data scientists continue to be individual contributors, accounting for 69% of this year's sample; 31% are managers.

- The median base salaries of data scientists increase with job level for both individual contributors and managers. Level 1 individual contributors earn a median base salary of $97,000, increasing up to $152,000 for those at level 3. For managers, those at level 1 earn a median base salary of $140,000, while those at level 3 earn $240,000.

- Across all job categories, more than 70% of data scientists are eligible for bonus pay. For managers in particular, more than 80% are eligible. Median bonuses received by data scientists vary from $10,000 for level 1 individual contributors, up to $80,000 for level 3 managers.

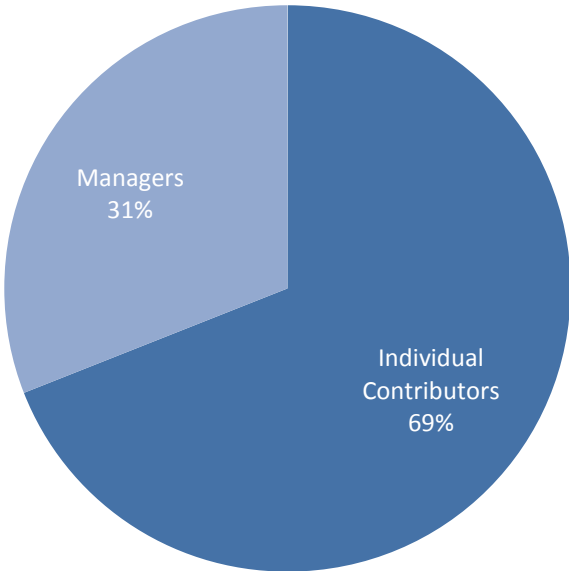*Figure 4.* *Distribution of Data Scientists by Management Responsibility*

Figure 5. Compensation of Data Science Individual Contributors by Job Level

Individual Contributor Job Level	N	Base Salary				Bonus		
		25%	Median	Mean	75%	Eligible	Median	Mean
Level 1	75	$85,000	$97,000	$95,793	$105,000	73.3%	$10,000	$10,551
Level 2	109	$115,000	$125,000	$126,646	$140,000	78.0%	$15,000	$24,182
Level 3	75	$141,500	$152,000	$156,667	$175,000	73.3%	$21,000	$24,436

Figure 6. Compensation of Data Science Managers by Job Level

Manager Job Level	N	Base Salary				Bonus		
		25%	Median	Mean	75%	Eligible	Median	Mean
Level 1	36	$125,000	$140,000	$138,583	$150,000	80.6%	$15,000	$19,290
Level 2	61	$180,000	$190,000	$192,508	$200,000	90.2%	$39,900	$49,080
Level 3	18	$226,250	$240,000	$264,333	$277,750	88.9%	$80,000	$91,736

Figure 7. Median and Mean Base Salaries of Data Science **Individual Contributors** by Job Level
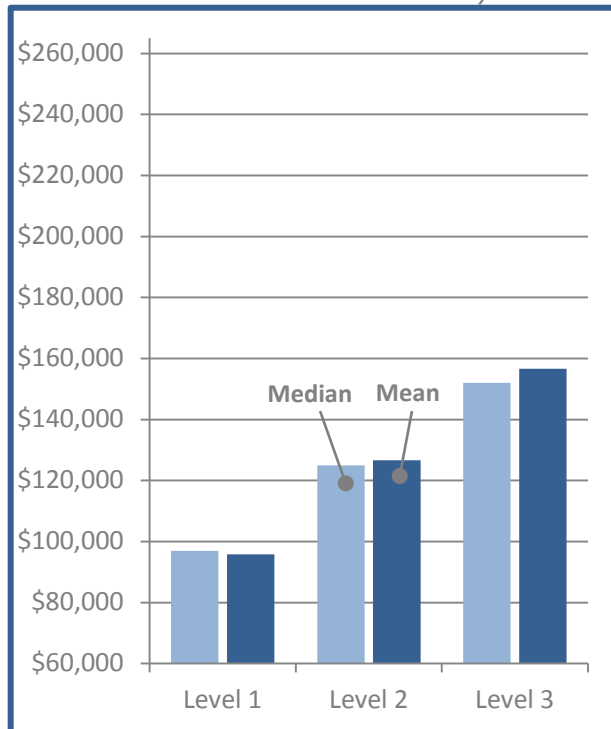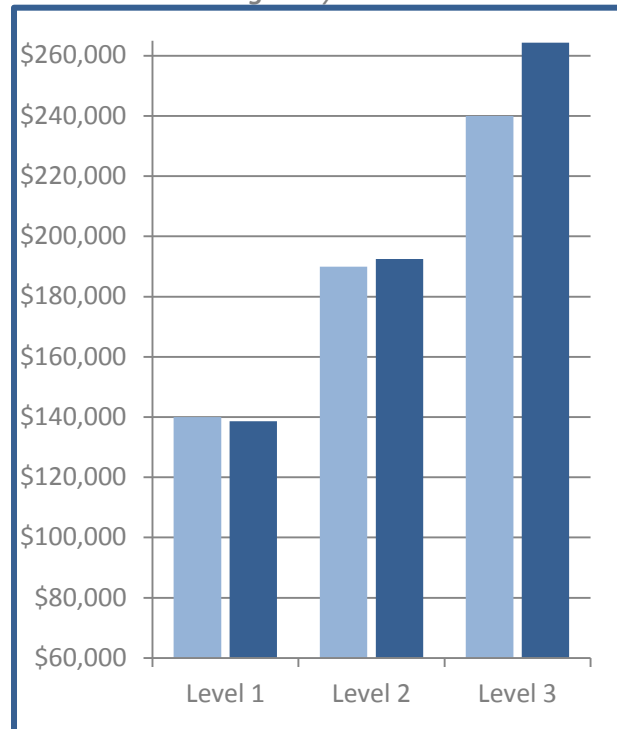

Figure 8. Median and Mean Base Salaries of Data Science **Managers** by Job Level

Compensation of Data Scientists
vs. Other Predictive Analytics Professionals

- Data scientists continue to earn higher median base salaries than other predictive analytics professionals across every job category.

- The difference in base salaries is largest among individual contributors, where data scientists earn from 22% to 39% more than other predictive analytics professionals. For example, individual contributors at level 1 earn a median base salary of $97,000 within data science, and $76,000 in other predictive analytics positions.

- The difference in salaries is smaller for managers, but data science managers still earn more than those within predictive analytics. Level 3 managers earn 2% more in data science, while those at levels 1 and 2 earn 12% more. As an example, data science managers at level 1 earn $140,000 while other predictive analytics professionals at the same level earn $125,500.

- There are factors which impact this difference in pay:

    o Data scientists possess more specialized data skills in order to work with large, unstructured datasets (see **Identifying Data Scientists** on p. 32).

    o Nearly one-half of data scientists (48%) hold a Ph.D. compared to only 17% of other predictive analytics professionals (see Figure 12 on p. 19).

    o There is still a considerable amount of attention, some might say hype, on the data science profession, resulting in a high demand for these professionals and upward pressure on their salaries.

Figure 9. *Median Base Salaries of Data Scientists vs. Other Predictive Analytics Professionals*
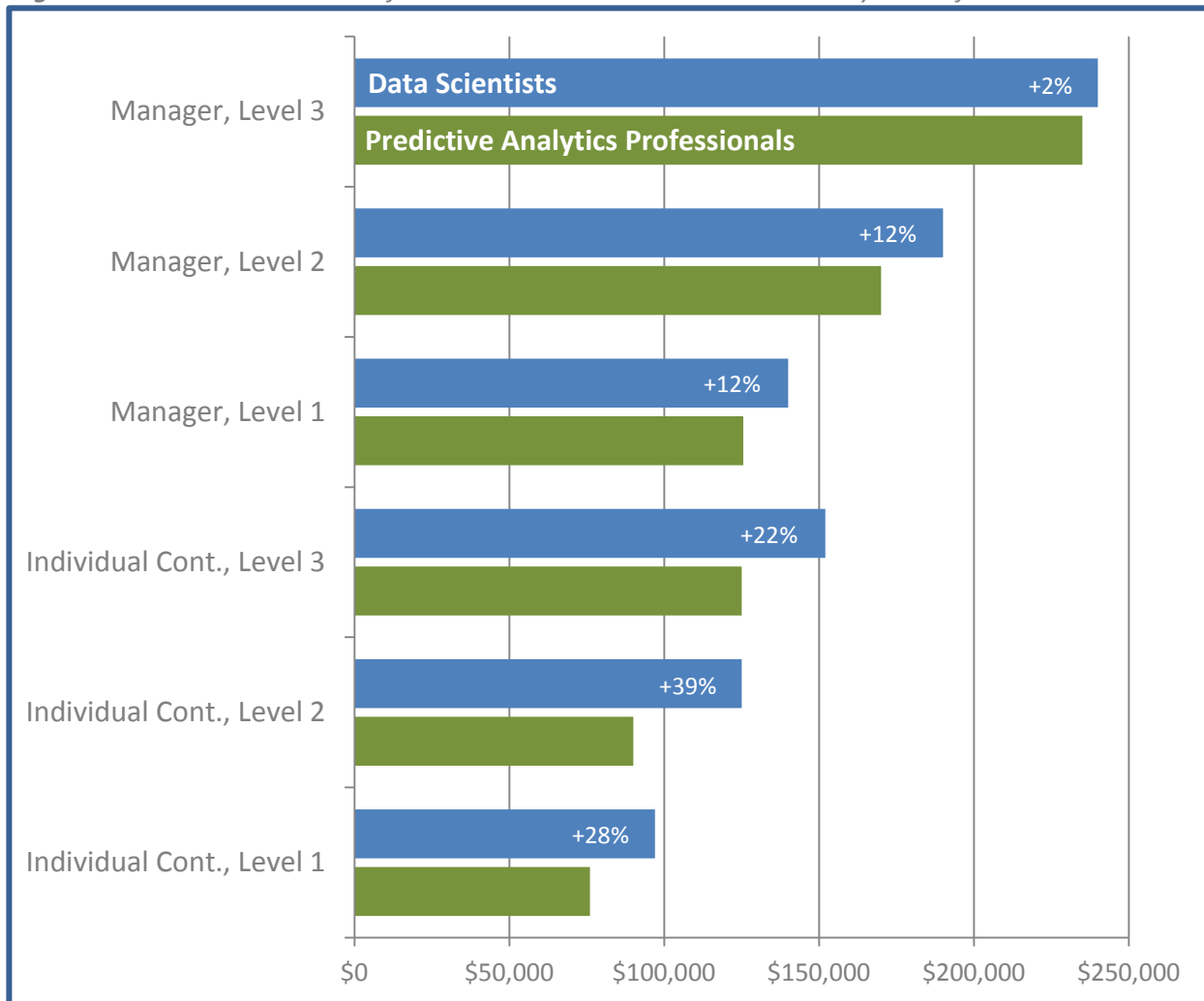
Education

- More than 9 out of 10 data scientists (92%) have an advanced degree: 44% hold a Master's degree, and 48% hold a Ph.D.

- 28% of data scientists hold a degree in statistics or mathematics, 18% have an engineering degree, and 17% hold a computer science degree.

- In every job category, those data scientists who hold a Ph.D. earn median base salaries equal to or higher than those holding only a Master's degree.

- There continue to be significantly more data scientists holding Ph.D.'s (48%) vs. other predictive analytics professionals (17%).

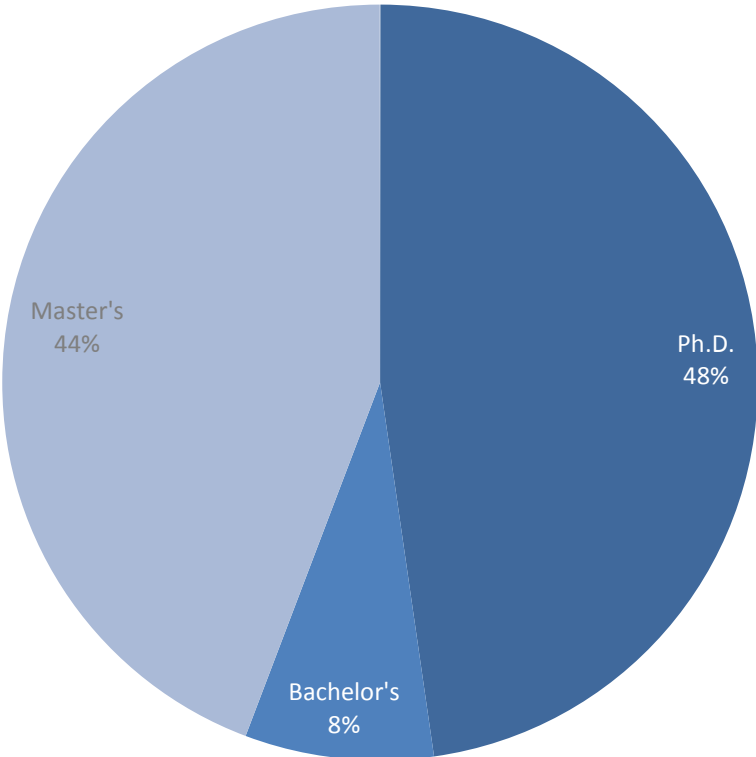*Figure 10. Distribution of Data Scientists by Education*

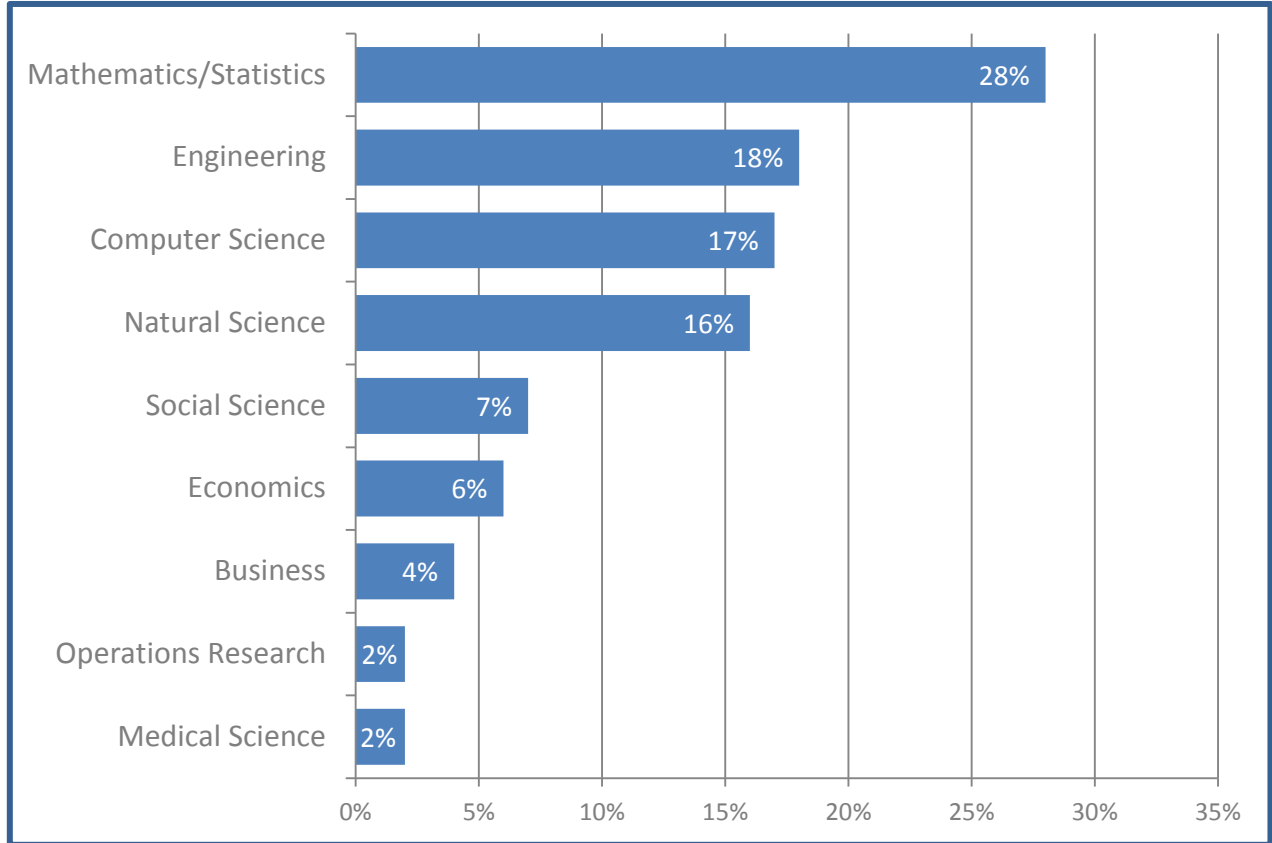**Figure 11.** *Distribution of Data Scientists by Area of Study*

Figure 12. *Distribution of Data Scientists and Other Predictive Analytics Professionals by Education*
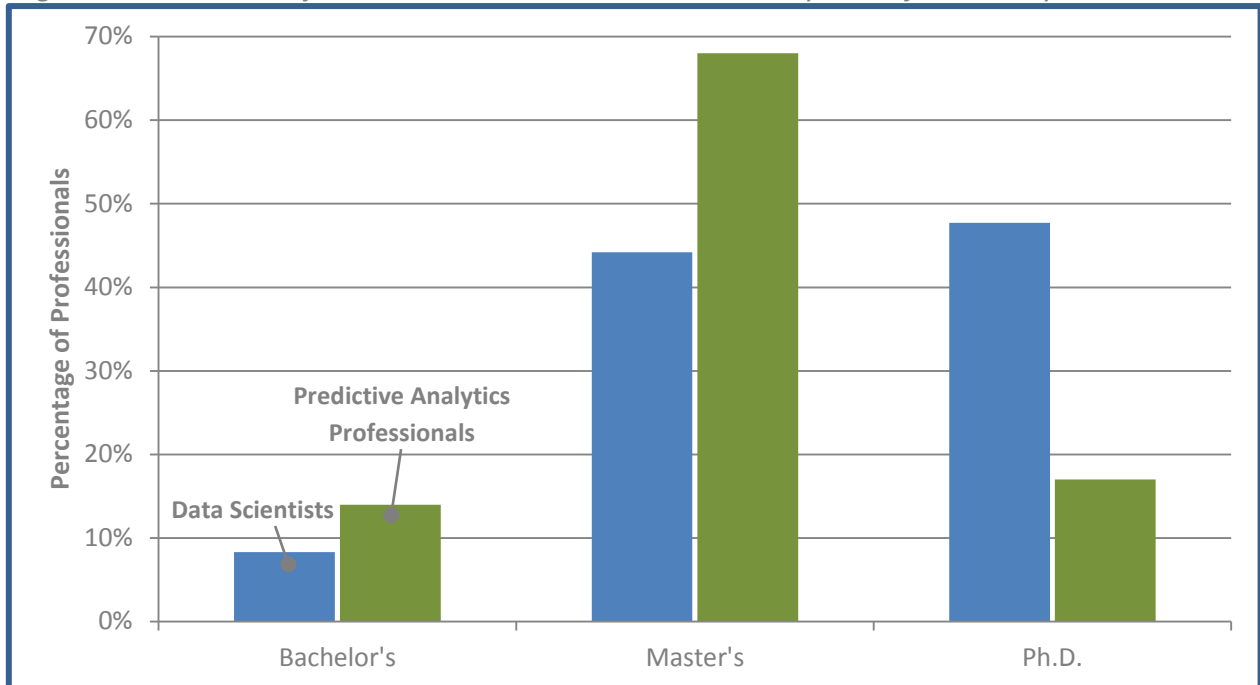
Figure 13. *Distribution of Base Salaries of Data Science Individual Contributors by Job Level and Education*

Job Level	Education	Base Salary				
		N	25%	Median	Mean	75%
Individual Contributor, Level 1	Master's	44	$82,000	$96,000	$94,307	$105,000
	Ph.D.	21	$93,000	$100,000	$100,333	$110,000
Individual Contributor, Level 2	Master's	32	$113,750	$125,000	$123,734	$135,375
	Ph.D.	71	$114,250	$125,000	$126,196	$140,000
Individual Contributor, Level 3	Master's	31	$140,000	$150,000	$153,935	$166,500
	Ph.D.	38	$145,000	$155,000	$158,605	$180,000

Note: Sample size for professionals with a Bachelor's degree was too small to report.

Figure 14. *Distribution of Base Salaries of Data Science Managers by Job Level and Education*

| Job Level	Education	Base Salary				
		N	25%	Median	Mean	75%
Manager, Level 1	Master's	21	$120,000	$130,000	$132,024	$145,000
	Ph.D.	12	$139,250	$148,250	$148,875	$158,750
Manager, Level 2	Master's	26	$170,000	$186,000	$187,500	$199,750
	Ph.D.	29	$180,000	$190,000	$196,724	$204,000
Manager, Level 3	Master's	9	$220,000	$230,000	$260,222	$252,000
	Ph.D.	9	$240,000	$250,000	$268,444	$300,000

Note: Sample size for professionals with a Bachelor's degree was too small to report.

DEEPER DIVE: Education of Early-Career Data Scientists

In this year's sample, a clear finding emerged regarding the educational background of early-career data scientists.

- A majority, 59%, of level 1 individual contributors' highest level of education is a Master's degree, compared to 48% in last year's study.

- This increase in Master's degree holders was counterbalanced by a decrease in Ph.D. holders: 28% of level 1 individual contributors hold a Ph.D. this year, down from 43% in 2015.

- These data seem to suggest that those interested in data science careers are seeking a faster route to the workplace, and are able to find such a path, as data science-oriented Master's programs continue to multiply across the country. Not only are students opting for the terminal Master's route over a traditional Ph.D., we predict that non-traditional educational paths will also begin to surge, as new data science and analytics MOOCs and bootcamps continue to develop.

Figure 15. Comparison of Education of Level 1 Individual Contributors

2015

2016
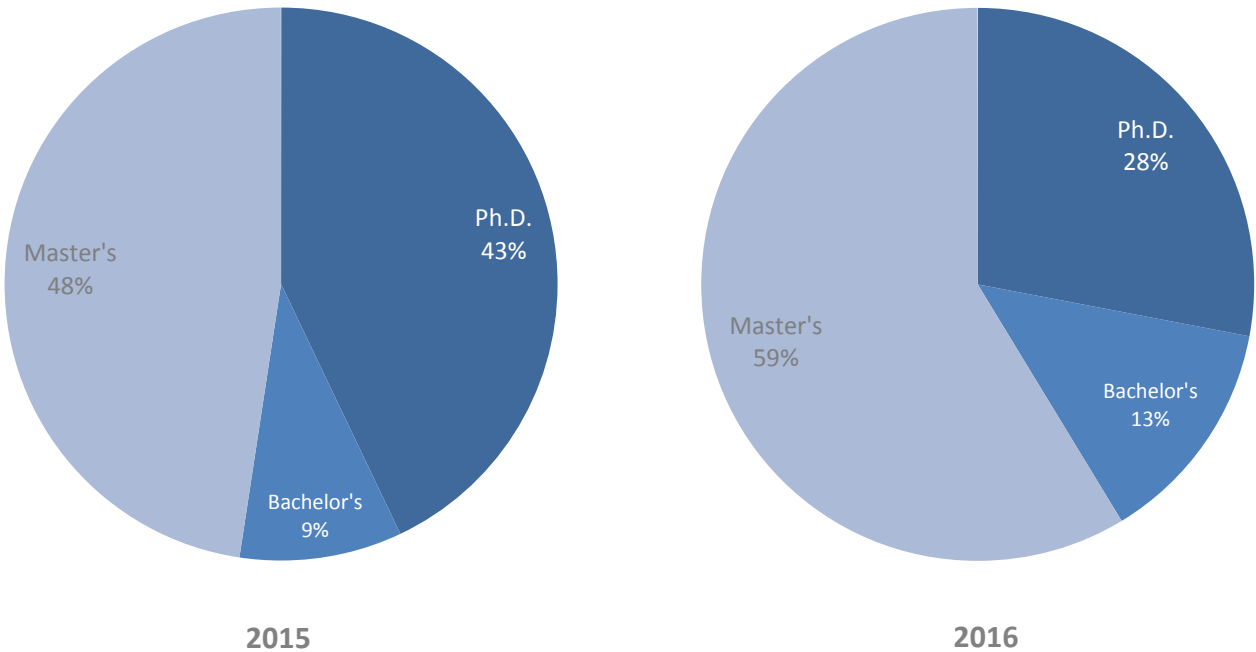
Region

- Most data scientists continue to be employed on the coasts: 43% are employed on the West Coast, and 28% are employed in the Northeast.

- In nearly all job categories, data scientists earn higher base salaries when employed on the coasts, compared to the Middle. U.S. For example, individual contributors at level 2 earn a median base salary of $130,000 on the West Coast, $125,000 in the Northeast, and $123,000 in the Middle U.S.

- For 5 out of 6 job categories, the highest base salaries are paid on the West Coast.

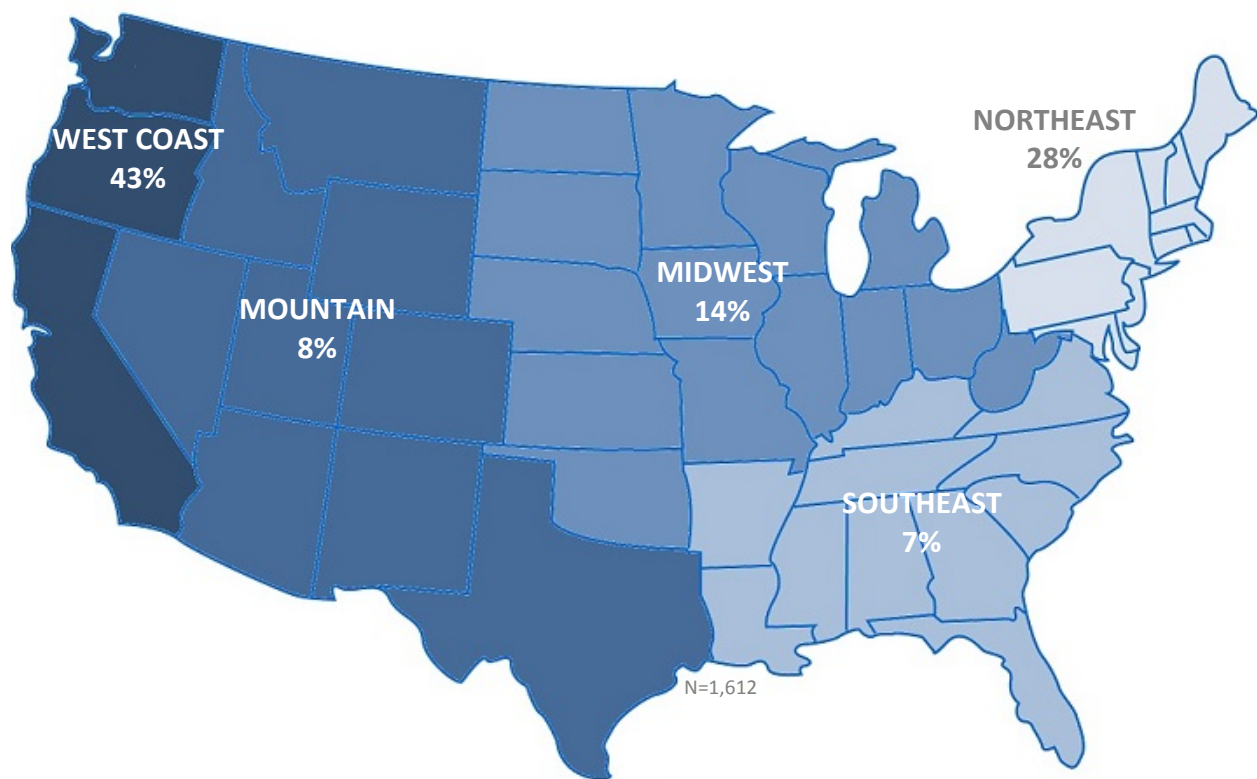*Figure 16.* *Distribution of Data Scientists by Region*

WEST COAST
43%

MOUNTAIN
8%

MIDWEST
14%

NORTHEAST
28%

SOUTHEAST
7%

N=1,612

Figure 17. *Distribution of Base Salaries of Data Science Individual Contributors by Job Level and Region*

Job Level	Region	Base Salary				
		N	25%	Median	Mean	75%
Individual Contributor, Level 1	Northeast	25	$85,000	$95,000	$96,840	$100,000
	Middle U.S.	34	$83,125	$94,500	$92,662	$102,250
	West Coast	16	$94,250	$104,000	$100,813	$114,000
Individual Contributor, Level 2	Northeast	31	$116,750	$125,000	$127,000	$140,000
	Middle U.S.	42	$103,500	$123,000	$122,095	$135,000
	West Coast	36	$122,300	$130,000	$131,650	$140,000
Individual Contributor, Level 3	Northeast	27	$145,000	$155,000	$154,889	$170,000
	Middle U.S.	25	$135,000	$150,000	$150,960	$170,000
	West Coast	23	$147,000	$155,000	$164,957	$185,000

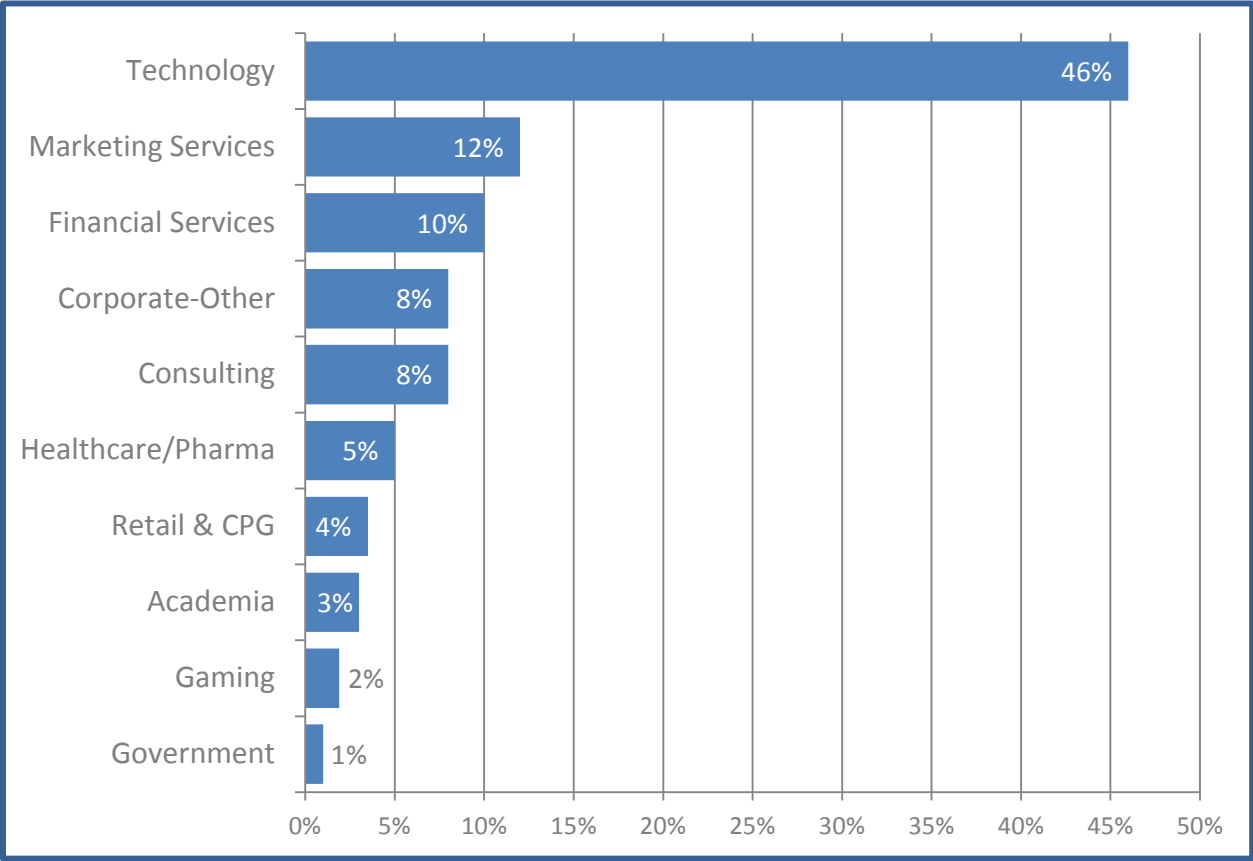**Figure 18.** *Distribution of Base Salaries of Data Science Managers by Job Level and Region*

Job Level	Region	Base Salary				
		N	25%	Median	Mean	75%
Manager, Level 1	Northeast	11	$131,000	$145,000	$148,545	$167,500
	Middle U.S.	17	$120,000	$125,000	$130,971	$147,500
	West Coast	8	$135,250	$142,500	$141,063	$147,375
Manager, Level 2	Northeast	20	$168,750	$185,000	$187,200	$200,000
	Middle U.S.	19	$175,000	$187,000	$186,211	$200,000
	West Coast	22	$185,000	$199,000	$202,773	$221,250
Manager, Level 3	Northeast	6	$228,750	$240,000	$260,000	$292,500
	Middle U.S.	5	$220,000	$220,000	$227,800	$240,000
	West Coast	7	$245,000	$253,000	$294,143	$293,000

Industry

- Technology organizations continue to be the largest employers of data scientists, accounting for 46% of data scientists. The financial services industry now employs more data scientists than in previous years: 10% of data scientists work in financial services companies compared to 6% in the 2015 report.

- Across nearly all job categories, those working for technology and gaming companies earn the same or higher median base salaries than data scientists employed in other industries.

- For level 1 individual contributors, data scientists working in other industries earn slightly higher base salaries (4%), than those within technology and gaming.

Figure 19. Distribution of Data Scientists by Industry

Industry	Percentage
Technology	46%
Marketing Services	12%
Financial Services	10%
Corporate-Other	8%
Consulting	8%
Healthcare/Pharma	5%
Retail & CPG	4%
Academia	3%
Gaming	2%
Government	1%

N=1,612

Figure 20. Distribution of Base Salaries of Data Science Individual Contributors by Job Level and Industry

| Job Level	Industry	Base Salary				
		N	25%	Median	Mean	75%
Individual Contributor, Level 1	Technology & Gaming	21	$82,000	$95,000	$96,071	$103,000
	All Others	54	$85,000	$98,500	$95,685	$105,000
Individual Contributor, Level 2	Technology & Gaming	46	$122,100	$125,000	$130,422	$140,000
	All Others	63	$110,000	$125,000	$123,889	$140,000
Individual Contributor, Level 3	Technology & Gaming	23	$147,500	$170,000	$168,565	$187,500
	All Others	52	$138,750	$150,000	$151,404	$168,500

Figure 21. Distribution of Base Salaries of Data Science Mangers by Job Level and Industry

Job Level	Industry	Base Salary				
		N	25%	Median	Mean	75%
Manager, Level 1	Technology & Gaming	14	$132,500	$146,250	$145,893	$157,500
	All Others	22	$121,250	$131,000	$133,932	$146,125
Manager, Level 2	Technology & Gaming	28	$185,000	$200,000	$200,107	$212,500
	All Others	33	$170,000	$185,000	$186,061	$198,000
Manger, Level 3	Technology & Gaming	5	$220,000	$250,000	$243,200	$253,000
	All Others	13	$230,000	$240,000	$272,462	$300,000

Residency Status

- 31% of data scientists are non-U.S. citizens with F-1/OPT, H-1B, or another visa, or permanent residency which allows them to work in the U.S., a decline from 36% last year.

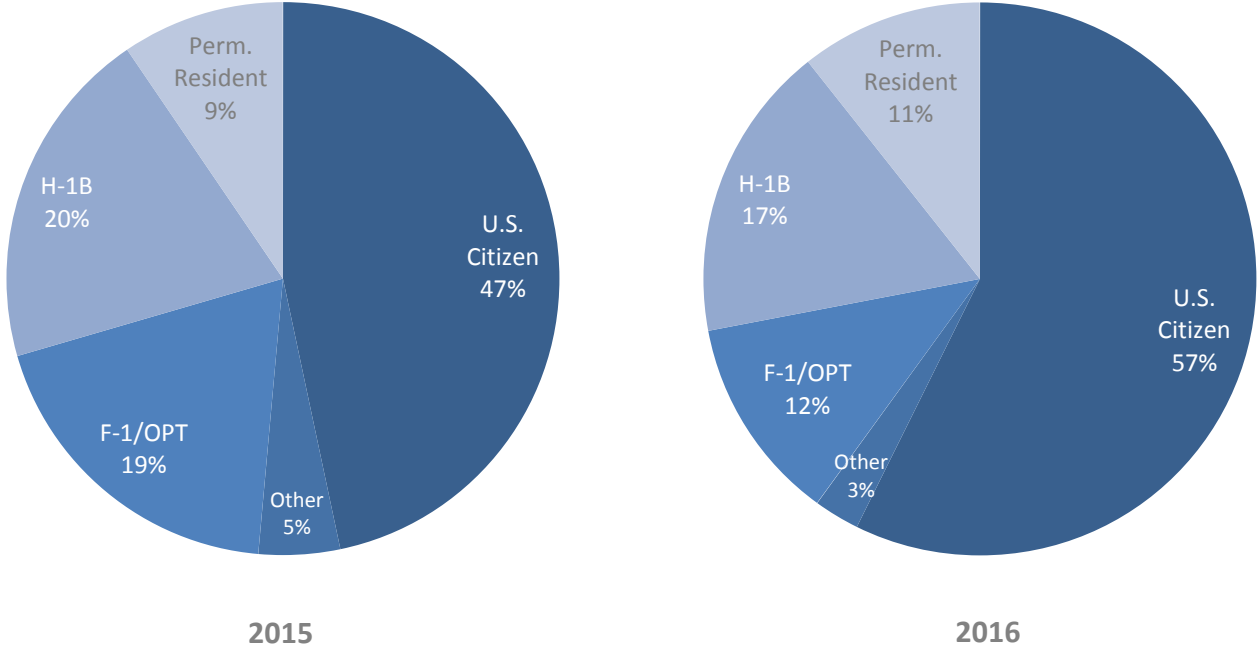*Figure 22. Distribution of Data Scientists by Residency Status*
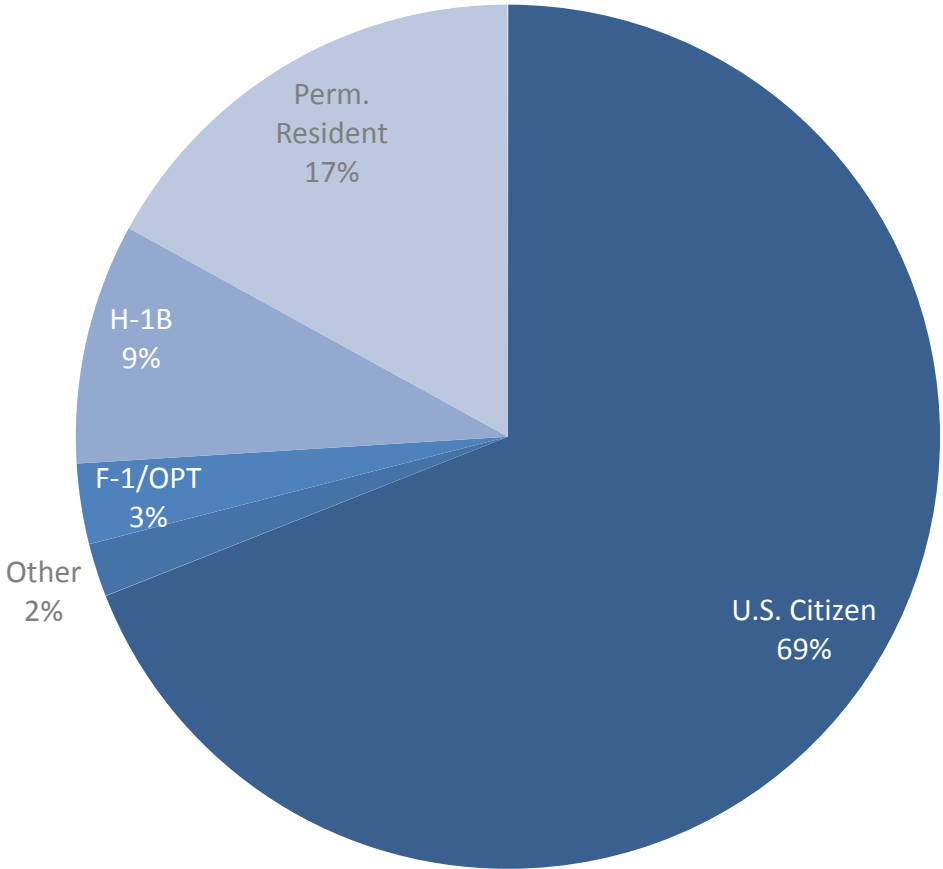
DEEPER DIVE: Residency Status of Early-Career Data Scientists

An interesting finding was uncovered regarding the residency of early-career data science talent.

- The biggest shift in residency status was seen among individual contributors at level 1: foreign-born professionals accounted for 43% of the group, compared to 53% last year.

- This result is another indicator of the shifting early-career market for data scientists, and is likely coupled with the educational shift that this year's data exhibits (see p. 21). Given the OPT visa extension program, STEM fields are typically filled with many foreign-born professionals, but it appears that American-born individuals are starting to constitute a larger proportion of data science professionals, as they gravitate toward this in-demand career.

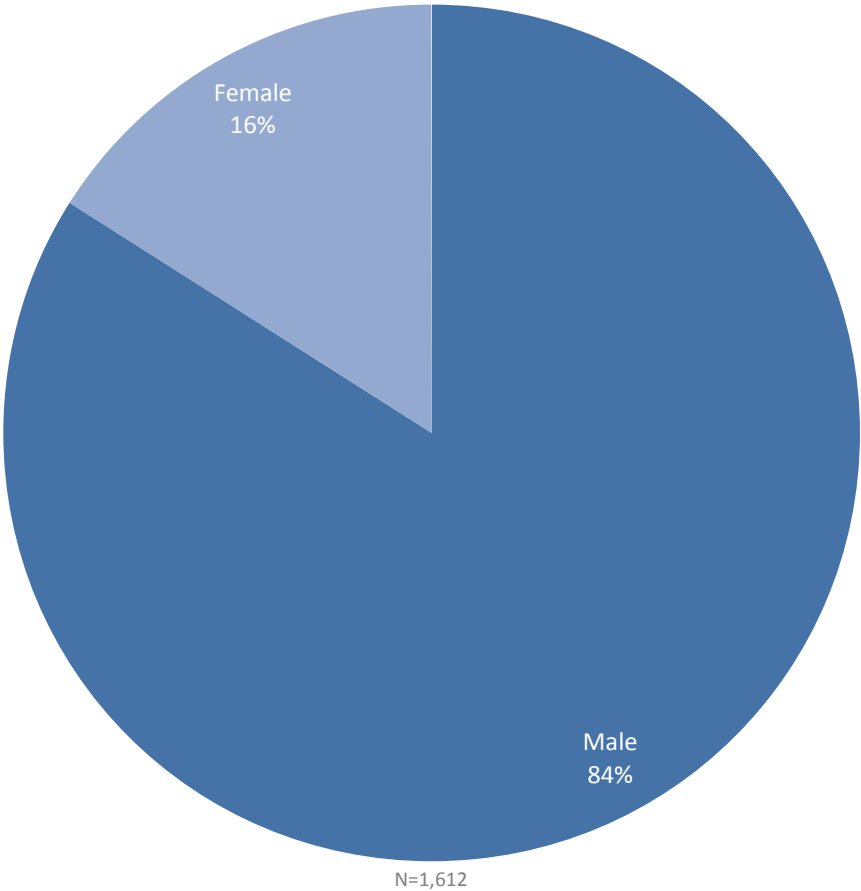*Figure 23.* *Comparison of Residency Status of Level 1 Individual Contributors*

2015

2016

Gender

- The large majority of data scientists (84%) are male.

Figure 24. *Distribution of Data Scientists by Gender*

Female
16%

Male
84%

N=1,612

Age

- The data science workforce continues to be comprised of a very young cohort of professionals. The median years of experience among data scientists is seven.

- 69% of data scientists have fewer than 10 years of experience, and almost 40% have fewer than 5 years.

Figure 25. Distribution of Data Scientists by Years of Experience
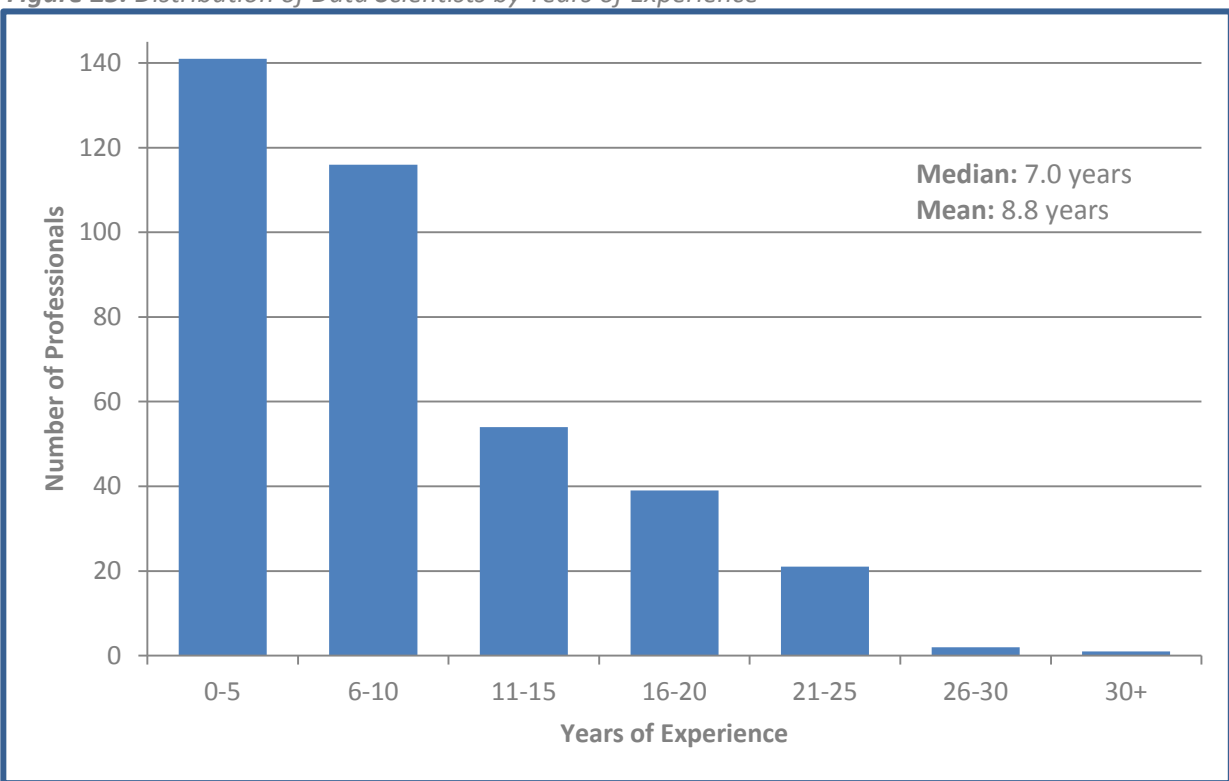
Note: The recruiters at Burtch Works do not ask the age of the professionals with whom they work. However, they do ask them for their years of work experience, which is highly correlated with age, and shown above is the distribution of data scientists by years of experience. However, salary information is not shown here, because salaries are indirectly related to years of experience through job category.

Section 4

APPENDIX A/Study Objective & Design

Study Objective

This report is a follow-up to last year's report, *The Burtch Works Study: Salaries of Data Scientists*, which was published in April 2015, and its goals are to show (1) current compensation of data scientists and how it varies, and (2) how their compensation has changed since last year's report. By continuing to interview large numbers of data scientists annually, Burtch Works can show both short-term and long-term trends in the demographic attributes of data scientists and their compensation.

Why the Burtch Works Studies Are Unprecedented

The Burtch Works Studies contain groundbreaking salary and demographic data for data scientists, and are unique because:

- **Burtch Works' studies focus solely on data scientists** – The study samples include only professionals who are data scientists, and exclude professions that other salary reports may include, such as business intelligence, operations research, information technology, and others in predictive analytics.

- **Burtch Works obtains this data by interviewing data scientists** – Instead of relying on data provided by human resources departments or from a self-reported online survey, Burtch Works interviews every data scientist individually. An important advantage of the interview process is that Burtch Works recruiters are able to obtain information about data scientists that is not usually provided by human resources departments that may affect their compensation, such as education and residency status. Additionally, because of their intricate understanding of the profession, recruiters are able to obtain corrections or clarifications when information provided does not seem credible.

- **Burtch Works' salary studies show how compensation varies by job level, region, industry, and education** – The sample size is big enough to show compensation data, collected over the past year, at a granular level. Further trends are illuminated with each consecutive report.

The Sample

This sample contains 374 of the more than 2,200 data scientists with whom Burtch Works maintains contact. Burtch Works collected the data for this study in interviews conducted over the 12 months ending March 2016, which is the year immediately following the period of interviews for the 2015 study. Professionals were included in the sample only if (1) they satisfied Burtch Works' criteria for data scientists, and (2) Burtch Works obtained complete information about that individual's compensation, demographic, and job characteristics.

How Changes in Compensation Were Measured

While some of the 374 data scientists in this sample were also in the samples for our previous studies (published in 2014 and 2015), others were not. Therefore, changes in compensation were not measured by differencing current compensation and compensation reported for the previous study and then taking medians (and other percentiles) of the differences. Instead, changes were measured by comparing medians (and other percentiles) of current compensation to those reported in last year's study.

Identifying Data Scientists

Data scientists apply sophisticated quantitative and computer science skills to both structure and analyze massive unstructured datasets or continuously streaming data, with the intent to derive insights and prescribe action. The depth and breadth of their coding skills distinguishes them from other predictive analytics professionals and allows them to exploit data regardless of its source, size, or format. Through the use of one or more general-purpose coding languages and data infrastructures, data scientists can tackle problems made very difficult by the size and disorganization of the data.

To identify data scientists, Burtch Works uses the following criteria:

1. **Educational Background** – Data scientists typically have an advanced degree, such as a Master's or Ph.D., in a quantitative discipline, such as Applied Mathematics, Statistics, Computer Science, Engineering, Economics, or Operations Research. New educational options include data science degree programs, massive open online courses (MOOCs), and bootcamps which continue to take hold in the quantitative community. Some candidates from related careers or fields of study have successfully pivoted into entry-level data science roles through premier bootcamps and mid-career Master's programs.

2. **Skills** – Data scientists have expert knowledge of statistical and machine learning methods using tools such as R and SAS, with predictive analytics still at the core of the discipline. Data scientists are usually proficient users of relational databases such as SQL, Big Data infrastructures like Hadoop and Spark, related tools like Pig and Hive, and frequently, AWS. Apache Spark has quickly gained the traction to rival Hadoop in the data science toolbox. Data scientists may use languages such as Python and Java (among others) to write programs to wrangle and manage data, automate analysis, and, at times, build these functions into production level code for SaaS companies. Many also use other methods to derive useful information from data, including pattern recognition, signal processing, and visualization.

3. **Dataset Size** – Data scientists typically work with datasets measured in gigabytes (or larger increments), and often work with continuously streaming data.

4. **Job Responsibilities** – Data scientists are equipped to work on every stage of the analytics life cycle which includes:

- **Data Acquisition** – This may involve scraping data, interfacing with APIs, querying relational and non-relational databases, or defining strategy in relation to what data to pursue.

- **Data Cleaning/Transformation** – This may involve parsing and aggregating messy, incomplete, and unstructured data sources to produce datasets that can be used in analytics and/or predictive modeling.

- **Analytics** – This involves statistical and machine learning-based modeling in order to understand, describe, or predict patterns in the data.

- **Prescribing Actions** – This involves interpreting analytical results through the lens of business priorities, and using data-driven insights to inform strategy.

- **Programming/Automation** – In many cases, data scientists are also responsible for creating libraries and utilities to operationalize or simplify various stages of this process. Often, they will contribute production-level code for a firm's data products.

Professionals whose jobs are described as predictive analytics, analytics management, business intelligence, and operations research were not classified as data scientists. This is because they either do not work with exceptionally large datasets, or do not work with unstructured data. Or, in the specific case of operations researchers, their function is to optimize well-described processes rather than predict and prescribe insights towards more nebulous problems like customer behavior. Predictive analytics professionals were the subject of their own study, *The Burtch Works Study: Salaries of Predictive Analytics Professionals*, released in September 2015.

Completeness & Age of Data

A data scientist was included in the sample only if Burtch Works has complete data about their compensation, and demographic and job characteristics.

All of the 374 data scientists in the sample were interviewed over the 12-month period ending March 2016, which is the year immediately following the period of interviews for the 2015 study. All were interviewed by Burtch Works recruiters executing searches for clients.

Segmentations of Data Scientists

To examine how the compensation of data scientists varies, Burtch Works used characteristics of their jobs (level, location of employer, industry) and demographic characteristics (gender, years of experience, residency status) to segment data scientists. Burtch Works developed the following job categories for the first series of *Burtch Works Studies*, and the definitions remain the same for the 2016 report:

Figure 26. Definition of Individual Contributor Job Levels

| Individual Contributors		
Level	*Responsibility*	*Typical Years of Experience*
Level 1	Learning the job, hands-on analytics and modeling, using unstructured data	0-3 years
Level 2	Hands-on with unstructured data, working with more advanced problems and models, may help train Analysts	4-8 years
Level 3	Considered an analytics Subject Matter Expert, mentors and trains analysts	9+ years

Figure 27. Definition of Manager Job Levels

Managers		
Level	*Responsibility*	*Typical Number of Reports*
Level 1	Tactical manager who leads a small group within a function, responsible for executing limited projects or tasks within a project	1-3 reports (direct or matrix)
Level 2	Manager who leads a function and manages a moderately sized team, responsible for executing strategy	4-9 reports (direct or matrix)
Level 3	Member of senior management who determines strategy and leads large teams, manages at the executive level	10+ reports (direct or matrix)

Burtch Works divided the U.S. into these five regions:
- Northeast
- Southeast
- Midwest
- Mountain
- West Coast

Figure 28. U.S. Geographic Regions
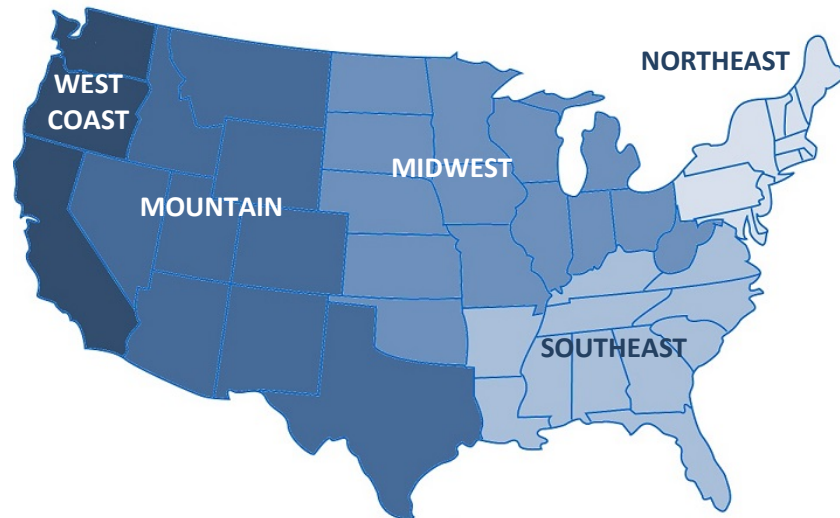
Note: The Northeast included areas of Virginia within 50 miles of Washington, DC, and the Midwest included areas of Pennsylvania within 75 miles of Pittsburgh.

The firms for which data scientists work were divided into these ten industries:
- Academia
- Advertising/Marketing Services
- Consulting
- Financial Services
- Gaming
- Government
- Healthcare/Pharmaceuticals
- Retail & CPG
- Technology/Telecom
- Other

Each data scientist was assigned to one of these five residency status categories:
- U.S. Citizen
- F-1/OPT
- H-1B
- Permanent Resident
- Other

Finally, each data scientist was assigned to one of these three education categories:
- Bachelor's degree
- Master's degree
- Ph.D.

Section 5

APPENDIX B/Glossary

Glossary of Terms

This section provides definitions of terms used in this report.

Base Salary. An individual's gross annual wages, excluding variable or one-time compensation such as relocation assistance, sign-on bonuses, bonuses, and long-term incentive plan compensation.

Bonus. Short-term variable compensation, usually awarded annually, such as individual or company performance-based bonuses. This does not include long-term incentive plan compensation or awards of stock or stock options.

Data Scientist. A predictive analytics professional who has both the proficiency for data management required to make enormous sets of unstructured data accessible and also the analytical skills for deriving useful information from those data.

Entry-level job. A job available to individuals who have no relevant prior work experience, but usually have just earned an undergraduate or graduate degree.

Equity. See Stock.

F-1/OPT. A residency status that allows a foreign undergraduate or graduate student who has a non-immigrant F-1 student visa to work in the U.S. without obtaining an H-1B visa. The student is required to have either completed his degree or pursued it for at least nine months.

Geographic Region. One of five groups of states that together comprise the entire United States. These five groups of states – Northeast, Southeast, Midwest, Mountain and West Coast – are shown in Figure 28 on page 35.

H-1B. A non-immigrant visa that allows a U.S. firm to temporarily employ a foreign worker in a specialty occupation for a period of three years, which is extendable to six and beyond. If a foreign worker with an H-1B visa quits or loses their job with the sponsoring firm, the worker must either find a new employer to sponsor an H-1B visa, be granted a new non-immigrant status, or leave the United States.

Individual Contributor. An employee who does not manage other employees. Individual contributors among the data scientists in the Burtch Works sample have all been assigned to one of three levels:

Level 1: Responsible for learning the job; hands-on with analytics and modeling, using unstructured data; 0-3 years' experience

Level 2: Hands-on with unstructured data, working with more advanced problems and models; may help train Analysts; 4-8 years of experience

Level 3: Considered an analytics Subject Matter Expert; mentors and trains Analysts; 9+ years' experience

Industry. One of ten groups of firms employing most data professionals. These ten industries are Academia, Advertising/Marketing Services, Consulting, Financial Services, Gaming, Government, Healthcare/Pharmaceuticals, Retail & CPG, Technology/Telecom and Other.

Academia: Institutions whose purpose is the pursuit of education or academic research such as public universities, private colleges, and for-profit education companies.

Advertising/Marketing Services: An industry consisting of firms that provide services to other firms that include advertising, market research, media planning and buying, and marketing analysis.

Consulting: Industry that includes both large corporations and small "boutique" firms that provide professional advice to the managers of other firms.

Financial Services: Firms that provide money management, lending, or risk management services, including banks, insurance companies, and credit card organizations.

Gaming: Industry that includes companies involved with the development, marketing, and sales of video games (defined as interactive electronic entertainment).

Government: Organizations that are a part of the governmental system, such as the Department of Defense and national research laboratories.

Healthcare/Pharmaceuticals: Firms that provide healthcare services, such as hospitals, and firms that manufacture medicinal drugs.

Retail & CPG: Organizations that purchase goods from a manufacturer to be sold for profit to the end-consumer (retail) and firms whose products are sold quickly and at relatively low cost (CPG or consumer packaged goods).

Technology/Telecom: Firms that create or distribute technology products or services, such as computer manufacturers and software publishers, and firms that provide telecommunications services.

Other: Companies whose industry falls outside of the categories described above, such as airline companies, distribution firms, media, and entertainment.

Manager. An employee who manages the work of other employees. Managers among the data scientists in the Burtch Works sample have all been assigned to one of three levels:

Level 1: Tactical manager who leads a small group within a function, responsible for executing limited-scale projects or tasks within a project; typically responsible for 1-3 direct reports or matrix individuals.

Level 2: Manager who leads a function and manages a moderately sized team; responsible for executing strategy; typically responsible for 4-9 direct reports or matrix individuals.

Level 3: Member of senior management who determines strategy and leads large teams; manages at the executive level; typically responsible for 10+ direct reports or matrix individuals.

Mean. Also known as the average, it is the sum of a set of values divided by the number of values. For example, the mean of N salaries is the sum of the salaries divided by N.

Median. The value obtained by ordering a set of numbers from smallest to largest and then taking the value in middle, or, if there are an even number of values, by taking the mean of the two values in the middle. For example, the median of N salaries is the salary for which there are as many salaries that are smaller as there are salaries that are larger.

N. The number of observations in a sample, sub-sample, or table cell.

OPT. See F-1/OPT.

Permanent Resident. A residency status that allows a foreign national to permanently live and work in the United States. Those with this status have a United States Permanent Residence Card, which is known informally as a green card.

Predictive Analytics Professionals. Individuals who can apply sophisticated quantitative skills to data describing transactions, interactions, or other behaviors to derive insights and prescribe actions. They are distinguished from the "quants" of the past by the sheer quantity of data on which they operate, an abundance made possible by new opportunities for measuring behaviors and advances in technologies for the storage and retrieval of data.

SaaS. Acronym for Software as a Service.

Salary Study. A study conducted to measure the salary distributions of those in specific occupations. Traditionally, these studies have been executed by obtaining salary data from the human resources departments of firms employing professionals in those occupations rather than by interviewing those employees themselves.

STEM. Acronym for the fields of Science, Technology, Engineering, and Mathematics.

Stock. Shares of a particular company as held by an individual or group as an investment.
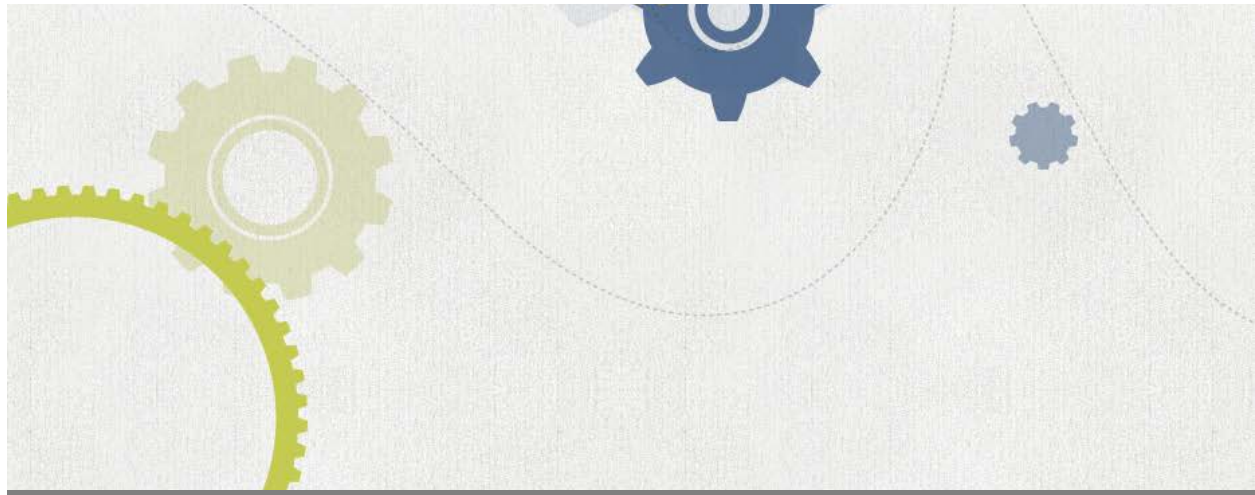
ABOUT BURTCH WORKS

Burtch Works is a uniquely targeted recruiting firm that focuses on placing quantitative professionals in data science and analytics roles nationwide. Our recruiters have decades of experience recruiting in their quantitative specialties, and have built strong relationships with hiring managers and HR professionals at a plethora of organizations in every industry, ranging from emerging startups, to Fortune 50 global corporations, to Wall Street hedge funds.

We have always closely followed hiring trends and talent movement, and developed *The Burtch Works Studies* as comprehensive industry reports on compensation and demographic trends within our primary specialties: predictive analytics, marketing research, and data science. Burtch Works' Founder and Managing Director, Linda Burtch, has over 30 years' experience in quantitative recruiting, and has been interviewed for her insights on this in-demand talent pool by The New York Times, The Wall Street Journal, CNBC, Mashable, The Chicago Tribune, Fox News, Forbes, All Analytics, Analytics Magazine, InformationWeek, and many more.

Whether you're looking to hire data scientists for your staff or evaluating your career options, let's chat about how we can partner with you!

CONTACT US

Looking to hire data science or analytic talent? Email clients@burtchworks.com to see what Burtch Works can offer your organization. Planning your next career move and want to see if we have positions that match your experience? Email your resume to candidates@burtchworks.com to start the process. For general inquiries, please call 847-440-8555, or email info@burtchworks.com.