

Occupational Employment and Wages, 1999

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Preface

This bulletin provides occupational employment and wage data from the Occupational Employment Statistics (OES) survey. It includes national, state, and MSA occupational employment and wage estimates across all industries as well as by industry. The tables highlight OES data for particular occupations, industries, states, and MSAs. Data are presented for Standard Occupational Classification (SOC) detailed occupations and major occupational groups. Data for additional occupations, industries and areas are available on <http://stats.bls.gov/oeshome.htm>. The data are based on information collected during 1997, 1998, and 1999 surveys and adjusted to full universe counts for the fourth-quarter 1999 reference period based on the Covered Employment and Wages program (except for data from New Jersey, which have a fourth-quarter 1998 reference period).

For many years, the OES survey has been a major source for detailed occupational employment data by industry for the nation, States and metropolitan areas. The OES survey is an annual mail survey collecting occupational employment and its distribution by wage interval for wage and salary workers in non-farm establishments by industry. The survey samples approximately 400,000 establishments per year, taking 3 years to fully collect the sample of 1.2 million establishments.

Due to the shift to the Standard Occupational Classification (SOC) system, employment estimates are based only on the data collected in the 1999 survey. Wage estimates for detailed occupations which changed under the SOC are based only on data collected in the 1999 survey, while wage estimates for detailed occupations which are unaffected by the SOC are based on data collected in the 1997, 1998, and 1999 surveys. For these reasons, data from 1997 and 1998 are not strictly comparable with data from the 1999 survey. (For further details, see Appendix B.)

This annual survey is part of the Federal-State cooperative program of occupational employment statistics, which provides information for many data users, including individuals and organizations engaged in planning vocational education programs, higher education, and employment and training programs. OES data also are used to prepare information for career counseling, for job placement activities performed at State employment security offices, and for personnel planning and market research conducted by private enterprises.

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Introduction

The Occupational Employment Statistics (OES) survey collects data on occupational employment and wages of wage and salary workers by industry in non-farm establishments. The program is a Federal-State cooperative effort between the State employment security agencies (SESAs) and the Bureau of Labor Statistics (BLS). The BLS provides technical assistance and the statistical procedures for the survey; the SESAs collect the data.

Articles presented in this bulletin were prepared using OES occupational employment and wage estimates. The articles cover topics such as cross-industry and industry specific occupational employment and wages, occupational wage distributions, and SOC major occupational group employment and wages by industry and across industries. The tables in this bulletin present national, State, MSA, and industry employment and wage data for detailed occupations. The industry data are identified based on the 1987 Standard Industrial Classification (SIC) system. The occupational data are identified based on the Standard Occupational Classification system. Under the SOC system, workers are classified in one of more than 760 occupations.

Cross-industry national employment and wage data for each

occupation are displayed in Table 1. It displays national employment, hourly mean wage, annual mean wage, and percentile wages for each detailed occupation.

Table 2 presents a sample of the data available from the OES survey, including national industry-specific and State and MSA cross-industry employment and wage data for the five largest occupations for each SOC major group. The industry data are national industry specific data for both the five industries with the highest employment and the five industries with the highest wages for this occupation. This differs from the national data in Table 1, which is based on data from all industries. Occupations such as teachers, however, only occur in a few or in some cases only one industry. The employment ranks and wage ranks for the industry data refer to the industry's occupational employment or wage estimate relative to other industries' employment and wage estimates for this occupation. In other words, the industry with employment rank 1 has the largest number of workers in this occupation; employment rank 2 has the second largest, etc. Likewise, the industry with a wage rank of 1 is the highest paying industry for these workers; wage rank of 4 is the fourth highest paying industry. In addition, Table 2 presents State and MSA occupational and

wage estimates for the five areas with the highest relative employment and the five areas where these workers earn the highest wages. The relative employment is the percentage of the total State employment found in this occupation. This provides more information than just looking at total employment, which usually parallels population - the largest States and MSAs usually have the largest number of workers regardless of the occupation. For data involving absolute employment, please refer to Doug Himes' article Occupational Employment and Wages by State in this publication.

In 1999, all 50 States, the District of Columbia, Puerto Rico, Guam, and the Virgin Islands participated in the survey. Data for the territories are not included in the national estimates. Industry specific occupational employment and wage estimates for each participating State and territory are available from the employment security agencies listed on the inside back cover of this bulletin.

Occupational employment estimates are based on survey results adjusted to reflect total industry employment. Mean wage is the estimated total wages for an occupation divided by its weighted survey employment. Occupations or industries with fewer than 50 workers, or with an employment relative error

greater than 50 percent are not shown. Wage estimates with a relative error greater than 30 percent are not shown.

Employment totals in this publication for all industries surveyed reflect employment levels in each industry for the survey reference months listed in Appendix B. Appendix B provides more complete definitions of terms and statistical concepts.

National, State, and Metropolitan Statistical Area (MSA) data across surveyed industries are available on the OES website (<http://stats.bls.gov/oeshome.htm>). National occupational employment data for all occupations at the 2-digit and more detailed 3-digit SIC level are also available on the website. Additional information about the structure of the OES classification system is provided in Appendix A of this bulletin. Definitions for all occupations are available upon request on the Standard Occupational Classification website (http://stats.bls.gov/soc/soc_home.htm).

Wages and employment by major occupational group

Fatemeh Hajiha

The following analysis examines employment and wages by major occupational group. The Standard Occupational Classification (SOC) system surveyed in OES consists of twenty-two major occupational groups: Management; business and financial operations; computer and mathematical; architecture and engineering; life, physical, and social science; community and social services; legal; education, training, and library; arts, design, entertainment, sports, and media; healthcare practitioners and technical; healthcare support; protective service; food preparation and serving related; building and grounds cleaning and maintenance; personal care and service; sales and related; office and administrative support; farming, fishing, and forestry; construction and extraction; installation, maintenance, and repair; production; and transportation and material moving.

Chart 1 displays employment, the percentage of total employment, and the mean wage for each of the twenty-two occupational groups. The chart is arranged by mean wage, with the highest paying occupational group on the top and the lowest

paying occupational group on the bottom. Total employment for all occupational groups is approximately 127 million workers.

In terms of employment, the twenty-two occupational groups fall into three broad categories. The first category consists of five occupational groups with the largest employment. They are sales and related; production; office and administrative support; transportation and material moving; food preparation and serving related. These five occupational groups account for more than one-half of total employment, or over 67 million workers. Among these five occupational groups, the office and administrative support occupations, with over 22.5 million workers, is the largest and the transportation and material moving group with over 9.5 million workers is the smallest. The mean wage in each one of these five major groups is less than the mean wage for all workers across occupational groups. These five occupational groups include the food preparation and serving related group that has a mean wage of \$7.50 per hour, the lowest of all occupational groups.

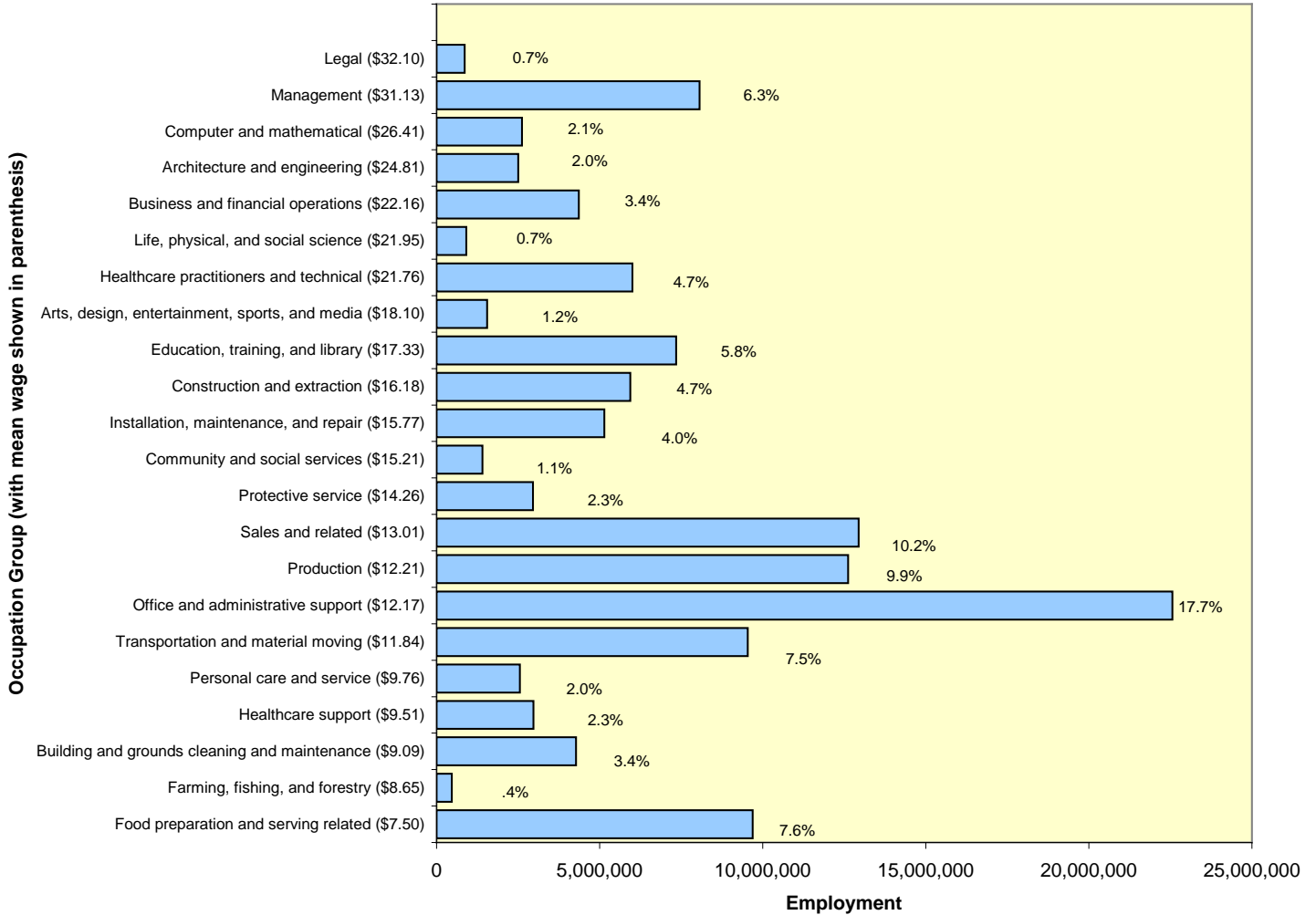
A second category consists of five occupational groups with mid-size employment. Accounting for over one-quarter of total employment, or 32.5 million workers, the occupational groups with mid-size employment are management; healthcare

practitioners and technical; education, training, and library; construction and extraction; and installation, maintenance, and repair. The mean wage in each one of these occupational groups is greater than the mean wage for the total workers in all occupational groups. The management group with about 8.1 million workers has the largest employment among the mid-size occupational groups and the second highest mean wage of all occupational groups. The installation, maintenance, and repair group with 5.1 million workers has the smallest employment and mean wage among the mid-size occupational groups. Still, the mean wage of \$15.77 per hour for the installation, maintenance, and repair group is higher than the mean wage for the total workers in all occupational groups.

The remaining twelve occupational groups account for less than 22 percent of total employment, or 27.4 million workers. Among these occupational groups, the business and financial operations group with less than 4.4 million workers has the largest employment, and the farming, fishing, and forestry occupations with less than 0.5 million has the smallest employment. Four of the twelve occupational groups - legal; computer and mathematical; architecture and engineering; and business and financial operations -- have the first, third,

fourth, and fifth highest mean wage of all occupational groups. Another four -- farming, fishing, and forestry; building and grounds cleaning and maintenance; healthcare support; and personal care and service - have the second, third, fourth, and fifth lowest mean wage of all occupational groups.

Chart 1. Employment level, mean wage , and percent share of employment by major occupational group, 1999



Percentile wages by occupational group

In addition to total employment and mean wage by major occupational group, text table 1 also displays the 10th, 25th, 50th, 75th, and 90th percentile wages for each of the twenty-two major occupational groups. A percentile wage shows the percentage of workers in an occupation that earn less than a given wage and the percentage that earn more. For example, the 50th percentile wage, or median wage, is the pay level at which 50 percent of workers earn above that wage and 50 percent earn below. Likewise, the 10th percentile wage shows that one-tenth

Text table 1: Percentile wages by major occupational group

Major occupational group	Employment	Hourly earnings					Mean wage
		10th percentile	25th percentile	50th percentile	75th percentile	90th percentile	
Total.....	127,274,000	6.33	8.13	12.10	18.85	27.44	15.18
Legal.....	858,320	12.09	16.38	26.50	46.65	68.23	32.10
Management.....	8,063,410	13.38	18.91	27.68	40.47	59.20	31.13
Computer and mathematical.....	2,620,080	14.11	18.61	24.99	32.81	41.53	26.41
Architecture and engineering.....	2,506,380	13.12	17.53	23.66	31.18	39.34	24.81
Business and financial operations.....	4,361,980	11.62	15.08	20.08	26.71	35.03	22.16
Life, physical, and social science	909,530	10.86	14.51	20.00	27.02	36.12	21.95
Healthcare practitioners and technical.....	6,001,950	9.93	13.71	18.73	25.33	35.72	21.76
Arts, design, entertainment, sports, and media	1,551,600	6.69	9.87	15.21	23.07	33.67	18.10
Education, training, and library	7,344,830	7.01	10.69	16.14	22.05	29.06	17.33
Construction and extraction	5,938,860	8.36	10.68	14.82	20.55	26.33	16.18
Installation, maintenance, and repair	5,140,210	8.32	10.88	14.84	19.79	24.95	15.77
Community and social services	1,404,540	8.17	10.56	14.01	18.89	24.36	15.21
Protective service.....	2,958,730	6.68	8.30	12.41	18.81	25.13	14.26
Sales and related	12,938,130	5.83	6.68	9.02	15.32	25.45	13.01
Production	12,620,920	6.76	8.21	10.75	14.94	20.27	12.21
Office and administrative support	22,562,480	7.00	8.69	11.14	14.73	19.02	12.17
Transportation and material moving	9,538,820	6.12	7.50	10.20	14.42	19.52	11.84
Personal care and service	2,556,920	5.69	6.37	7.82	10.57	16.34	9.76
Healthcare support.....	2,970,780	6.27	7.36	8.92	11.03	13.52	9.51
Building and grounds cleaning and maintenance	4,274,200	5.79	6.58	8.08	10.56	14.11	9.09
Farming, fishing, and forestry	463,360	5.83	6.20	6.96	9.74	14.27	8.65
Food preparation and serving related	9,687,970	5.50	5.96	6.64	8.32	10.65	7.50

of workers earn less than the 10th percentile wage and nine-tenths earn above it. The 90th percentile wage shows that 90

percent of workers earn less than the 90th percentile wage, and one-tenth earn above it. Thus, the middle 80 percent of workers in that occupational group earns wages between these two endpoints, the 10th and 90th percentile wages.

The lowest paid occupational group is the food preparation and serving related occupations. This is clearly indicated by the fact that, for each percentile wage shown, the food preparation and serving related group wage is lower than the same percentile wage for any of the other groups. In addition to being the lowest paid occupational group, the food preparation and serving related occupations have the narrowest distribution of wages of all occupational groups. Ten percent of workers in this group, approximately one million workers, earn less than \$5.50 per hour, while ninety percent of workers earn less than \$10.65 per hour, a difference of \$5.15 per hour. By contrast, the range of wages for the middle 80 percent of workers in the farming, fishing, and forestry occupations, the occupational group with the second lowest mean wage, is from \$5.83 to \$14.27, or \$8.44, or \$3.29 more than that for the food preparation and serving related group.

In addition to having the highest mean wage, the legal occupations have the widest distribution of wages. Ten percent

of workers in this group earn less than \$12.08 per hour, while ninety percent of workers earn less than \$68.23 per hour, a difference of \$56.14 per hour. However, the legal group does not have the highest wages in all percentile wage categories. The group ranks fourth in the 10th, and 25th percentile wages and second in the 50th percentile wage category.

There is general concordance between the ranking of occupational groups by mean wage and their rankings by the 10th, 25th, 50th, 75th, and 90th percentile wages. The Spearman rank correlation coefficients¹ between the groups' mean wage and their 10th, 25th, 50th, 75th, 90th percentile wages are, respectively, 0.93, 0.96, 0.98, 0.99, and 0.98. A rank correlation coefficient of one indicates identical rankings between the groups' mean wages and their percentile wages. The rank correlation coefficient between the mean wage and the 75th percentile wage is the highest, and that between the mean wage and the 10th percentile wage is the lowest, indicating that the similarity of the occupational groups' rankings by the mean wage and the 75th percentile wage is greater than their ranking by the mean and the 10th percentile wage.

¹ Mutual dependence or concordance between the rankings of two variables, x and y, can be assessed through the Spearman rank correlation coefficient, $r_s = 1 - (6 \sum D^2) / n(n^2 - 1)$, where D is the rank difference, and n the number of observations on x and y. If the two rank orders are identical, the rank differences are all zero, and $r_s = 1$. If one rank order is the reverse of the other, so that there is total discrepancy, we get $r_s = -1$.

As shown in text table 1, the mean wage in every occupational group is higher than the 50th percentile or median wage in that group suggesting that the top half of workers have a wider wage distribution than the lower 50 percent of workers. In other words, the distribution of wages in each occupational group is skewed towards the higher end of wages. This impression is reinforced by the fact that the Spearman rank correlation coefficients between the mean wage and the 75th and 90th percentile wages are higher than those between the mean wage and the 10th and 25th percentile wages.

The wage distributions are not equally skewed towards the higher wages in all occupational groups. The wage distributions in four occupational groups - legal; arts, design, entertainment, sports, and media; sales and related; and personal care and service - are comparatively more skewed towards the higher wages. The arts, design, entertainment, sports, and media group, for instance, ranks eighth in terms of mean wage and the 75th, and 90th percentile wages, but fourteenth in the 10th percentile, twelfth in the 25th percentile, and ninth in the 50th percentile wages. By contrast, the wage distributions in occupational groups such as the office and administrative support; healthcare support; installation,

maintenance, and repair; and protective services are comparatively less skewed towards the higher wages. The office and administrative support group for instance, ranks sixteenth or lower in the mean wage and the 75th and 90th percentile wages but twelfth in the 10th percentile wage, thirteenth in the 25th percentile wage, and fourteenth in the 50th percentile wage.

Chart 2 uses the percentile wages from text table 1 to graphically display the wage distribution for each major occupational group. Together, the entire bar represents the middle 80 percent of the distribution for each occupational group. The left endpoint of the bar indicates the 10th percentile wage - 10 percent of workers in that occupational group earn less than that wage. The right endpoint of the whole bar indicates the 90th percentile wage - another 10 percent of workers in that occupational group earn more than that wage. Thus, 80 percent of all workers in that occupational group earn wages between those two endpoints. Similarly, the darker inner bar shows the middle 50 percent of the distribution for each of the occupational groups. The left endpoint of the inner bar indicates the position of the 25th percentile wage, while the right endpoint of the inner bar indicates the position of the 75th percentile wage. Thus, half of all workers in that

occupational group earn wages between the two endpoints of the dark inner bar.

The legal occupations group has the highest mean wage and the widest wage distribution for both the middle 80 percent and middle 50 percent of workers. Over 56 dollars separates the 10th percentile wage of \$12.09 per hour and the 90th percentile wage of \$68.23 per hour. The middle 50 percent of workers for the legal group have a wage distribution of over thirty dollars.

The food preparation and serving related occupations has the lowest mean wage and the narrowest wage distributions for both the middle 80 percent and the middle 50 percent of workers. The middle 80 percent of workers for the food preparation and serving related group have a wage distribution of \$5.25. And, the middle 50 percent of workers in that group have a wage distribution of only \$3.36.

As shown in chart 2, the width of wage distribution for both the middle 80 percent and middle 50 percent of workers in an occupational group declines with the mean wage in that group. This impression gains support from the fact that the Spearman rank correlation coefficients between the mean wage and wage spreads for the middle 80 percent and middle 50 percent of workers are greater than 0.96.

Wages for the middle 50 percent of workers are skewed to varying degrees toward the lower end of the pay distribution for all occupational groups. More noticeable are the farming, fishing, and forestry; personal care and service; and sales and related groups with only 37 cents, 68 cents, and 85 cents, respectively, separating the 10th percentile wage from the 25th percentile wage. The amounts separating the 75th percentile wage from the 90th percentile wage in those three occupational groups are, respectively, \$4.53, \$5.77, and \$10.13, at least nine times greater than the amounts separating the 10th percentile wage from the 25th percentile wage. By contrast, wages for the middle 50 percent of workers in computer and mathematical; architecture and engineering; education, training, and library; and installation, maintenance, and repair groups are comparatively less skewed toward the lower of the pay distribution. In these occupational groups the amounts separating the 75th percentile wage from the 90th percentile wage are at most twice the amounts separating the 10th percentile wage from the 25th percentile wage.

In addition to cross-industry estimates for the twenty-two OES major occupational groups, the OES program produces detailed occupational wages across all industries. These estimates show that wages for detailed occupations can vary within a major

occupational group. Because of these variations, even though a major occupational group as a whole may pay more than the another major occupational group as a whole, wages for detailed occupations between groups may not follow the overall pattern for the group. To see how occupational wages vary for these occupational groups, see the article *Occupational Employment Estimates by Industry* by Patrick Kilcoyne in this publication. For additional analysis of wage dispersion using percentile wage distributions, see the article by John Jones in this publication *Wage Dispersion Among Selected Industries*.

Occupational Estimates by Industry

Patrick Kilcoyne

The Occupational Employment Statistics (OES) program produces estimates of occupational wages and employment. One useful way to analyze these estimates is to categorize them by Standard Industrial Classification (SIC) code. At the 2-digit SIC level, the OES program maintains statistics for 70 major industry groups. These major groupings are further divided into 3-digit SIC industry groups. SIC categories identify the principal activities which establishments are engaged in. This article will discuss how occupational wages may vary within broad occupational groups by industry.

Text table 1 cross-indexes mean hourly wages by Standard Occupational Classification (SOC) major group and 2-digit SIC industry code. This allows comparison between wages paid for the same occupational group in different industries, as well in the same industry for different occupational groups. Data for detailed occupations and specific industries are summed into their respective SOC and SIC major groups. Even though this table may be general, we are still able to see which industries and occupational groups generally offer the highest and lowest rates of pay. If no data were available for a particular industry/occupation, or if the relative standard error of the sample is too high, the words "n.a." appear in the matrix box.

This table displays mean wages for every major group of occupations at the 2-digit SIC level; and therefore, makes it

possible to examine the range of wages paid across all industries for every occupational group. The largest range, \$40.04, occurs in the legal occupations where the highest wage is \$53.18 in the amusement and recreation industry, and the lowest wage is \$13.14 in the automotive dealers and service industry. The smallest range is in the building and grounds cleaning and maintenance occupations where the lowest wage is \$7.49 per hour in the motion pictures industry, and the highest wage is \$15.22 per hour in the transportation equipment industry, giving a range of \$7.73. However, only a small number (less than 1 percent) of the employees in these two occupations work in any of the four industries. Further information for employment for these major occupational groups by industry is available from the OES website.

If we look at the highest and lowest paying occupations in each industry, text table 1 demonstrates a significant pattern across the 70 2-digit SIC groups. In fact, the highest paying major occupational group in over 60 percent (44 out of 70) of the industries is legal occupations, and management occupations are the highest paying in over 32 percent (23 out of 70) of the industries. This means that these two occupational groups receive the highest salary in over 90 percent of the major industries, even though the two groups accounted for only 7 percent of total the U.S. employment of 127 million in 1999. The lowest paying occupations are fairly evenly divided among food preparation and serving (23 out of 70), personal care and service (16 out of 70), building and grounds cleaning and

maintenance (14 out of 70), and farming, fishing, and forestry (11 out of 70). These four occupational groups combined account for approximately 13 percent of total employment.

This table demonstrates that the same group of occupations can offer a higher wage in some industries than in others. This is possibly an effect varying pay rates for the same occupation in different industries or different makeup of detailed occupations within the occupational group in different industries. For instance, in the occupational group sales and related, there is a great difference between the mean hourly wage of \$7.24 received in the SIC group eating and drinking places, and the wage of \$36.69 received in the security and commodity brokers industry. This is due to the fact that the vast majority of the sales and related workers in eating and drinking places are cashiers (SOC code 41-2011), whereas in the security and commodity brokers industry, almost all of the sales workers are employed as security, commodity, and financial services sales agents (SOC code 41-3031), which presumably requires a higher degree of skill and training or experience. Since occupational groups incorporate data from as many as 75 specific occupations into the mean hourly wages displayed on the table, there can be a large variance in the wages paid within an occupational group. For example, the legal occupations group includes occupations such as lawyers and legal secretaries. The wages and employment from both are included in the overall wage and employment estimates for legal occupations, even though the mean hourly wage of lawyers is almost three times as high as

that of legal secretaries. The shares of employment for these occupations with legal occupations in each industry will affect the wages for the entire group.

In addition to the composition of the occupational group affect the wage, sometimes the same specific occupation will offer a higher wage even within an industry group. This fact highlights the distinction between 3-digit and 2-digit SIC groupings. As an example, the occupation accountants and auditors (SOC 13-2011) has a mean hourly wage of \$19.18 in SIC 73. In this occupation, 15,940 people are working in the industry computer related services (SIC 737) and earning an hourly mean wage of \$20.81. The same occupation has 17,690 people employed in the personnel supply services industry (SIC 736) who earn a wage of only \$18.31. Similarly, instructional coordinators (SOC 25-9031) has 18,710 people working in colleges and universities (SIC 822) earning an hourly mean wage of \$19.66, whereas the same occupation has 27,750 people employed at elementary and secondary schools earning a wage of \$23.94. These discrepancies might be accounted for by different levels of responsibilities or experience, job duties, or other factors that may vary by industry. In addition, employment and wages may vary by area.

Text table 2 lists the 22 major occupational groups in order of total employment in 1999, along with the industry which

employs the greatest number of those workers. As shown on this table, the most numerous major occupational group is office and administrative support (SOC code 43-0000) with over 22 million employees. Government (which includes federal state and local workers) is the largest employer of this group, as well four other major occupations.

Conversely, on a more detailed occupational level, nine of the ten most numerous government occupations are either in the protective service group (e.g. police and sheriffs patrol officers and correctional officers and jailers) or the office and administrative support group (e.g. postal service mail carriers and postal service mail sorters, processors and processing machine operators). Although employment in five of the major groups is concentrated in Government, there is great variation among the industries employing the largest number of workers in remaining occupational groups: no other industry group appears on the table more than twice.

Data on how wages vary for detailed occupation by 2-digit industry can be found in Table 2 of this publication. Occupational employment and wage data for 3-digit industries is available on the OES web site. An analysis of how employment and wage varies by 3-digit industry can be seen in the article by Carrie Jones *Healthcare prognosis: Health employment and healthy wages* in this publication.

Table 2 Total employment by major occupational group in 1999

Rank	Major Occupational Group	Employment	Largest major industry	Percent employed by main industry
1	Office and administrative support	22,562,480	Government	12 %
2	Sales and related	12,918,290	Miscellaneous retail	13 %
3	Production	12,620,920	Industrial and commercial machinery and computer equipment	9 %
4	Food preparation and serving related	9,687,970	Eating and drinking places	70 %
5	Transportation and material moving	9,538,820	Motor freight transportation and warehousing	13 %
6	Management	8,063,410	Government	7 %
7	Education, training, and library	7,344,830	Educational services	88 %
8	Healthcare practitioner and technical	6,001,950	Health services	75 %
9	Construction and extraction	5,938,860	Construction-special trade contractors	48 %
10	Installation, maintenance, and repair	5,140,210	Automotive dealers and gasoline service stations	11 %
11	Business and financial operations	4,361,980	Government	17 %
12	Building and grounds cleaning and Maintenance	4,274,200	Business services	23 %
13	Healthcare support	2,970,780	Health services	75 %
14	Protective service	2,958,730	Government	56 %
15	Computer and mathematical science	2,620,080	Business services	38 %
16	Personal care and service	2,556,920	Social services	18 %
17	Architecture and engineering	2,506,380	Engineering, accounting, research, management, and related services	25 %
18	Arts, design, entertainment, sports, and media	1,551,600	Motion pictures	15 %
19	Community and social services	1,404,540	Social services	33 %
20	Life, physical, and social science	909,530	Government	26 %
21	Legal	858,320	Legal services	56 %
22	Farming, fishing, and forestry	463,360	Agricultural services	55 %

Healthcare prognosis: Healthy employment and healthy wages

Carrie Kathryn Jones

The public and media have been paying increased attention to the healthcare industry in recent years. A population that is growing older and living longer, along with innovations in medical technology have led to growing employment and higher pay in healthcare-related occupations. In the past five years the number of workers in this sector has increased by 11 percent². This article discusses the employment and wages for healthcare workers as shown in Table 2 of this publication. The employment and wage figures listed are the estimates calculated by the 1999 Occupational Employment Statistics (OES) survey. The dollar amounts listed are mean hourly wages.

The healthcare industry is defined as the Standard Industrial Classification (SIC) 80 - healthcare services. This includes offices of doctors of medicine (SIC 801), offices of dentists (SIC 802), nursing and personal care facilities (SIC805), hospitals (SIC806), medical and dental laboratories (SIC807), and home healthcare services (SIC808). Healthcare occupations are those

² This figure is calculated from data produced by the Covered Employment and Wages, or ES-202 program of the Bureau of Labor Statistics.

occupations that are included in the Standard Occupational Classification (SOC) major groups 29-0000 and 31-0000 - healthcare practitioner and technical occupations and healthcare support occupations respectively. In addition, there are a few occupations outside of these two major groups that are also discussed in this article. These include medical and health services managers (SOC 11-9111), medical secretaries (SOC 43-6013), and dental laboratory technicians (SOC 51-9081).

This article will highlight employment and wages of healthcare occupations. It also will discuss where healthcare related occupations are concentrated or receive the highest wages. In addition, this article will examine the healthcare industry both as a whole and broken down into its smaller sectors all at a national level.

Text table 1 – Healthcare occupations (cross-industry) by largest employment³

Occupational title	Employment	Hourly mean wage	Annual mean wage	Employment rank	Wage rank of 61
Registered nurses	2,205,430	\$21.38	\$44,470	1	23
Nursing aides, orderlies, and attendants	1,308,740	8.59	17,860	2	60
Licensed practical and licensed vocational nurses	688,510	13.95	29,020	3	39
Home health aides	577,530	9.04	18,810	4	59
Medical assistants	281,480	10.89	22,650	5	50
Medical and health services managers	230,640	27.93	58,090	7	16
Pharmacists	226,300	30.31	63,030	8	14
Pharmacy technicians	196,430	9.64	20,050	10	57
Radiologic technologists and technicians	177,850	17.07	35,510	11	31
Dental assistants	175,160	11.60	24,130	12	45

³ Residual (“All other...”)occupations are not included.

Text table 2 - Healthcare occupations (cross-industry) by highest wages

Occupational title	Employment	Hourly mean wage	Annual mean wage	Employment rank	Wage rank of 61
Surgeons	48,450	\$65.22	\$135,660	34	1
Obstetricians and gynecologists	18,780	65.11	135,430	51	2
Anesthesiologists	25,910	59.51	123,780	47	3
Internists, general	48,740	59.27	123,280	32	4
Pediatricians, general	18,940	54.21	112,760	50	5
Dentists	69,360	51.03	106,130	25	6
Family and general practitioners	134,490	50.04	104,090	18	7
Psychiatrists	17,870	49.84	103,660	53	8
Podiatrists	4,470	48.12	100,090	60	9
Optometrists	21,400	37.38	77,750	49	10

Healthcare occupations

Text tables 1 and 3 show national employment and wage estimates for the top ten occupations based on the number of workers; text tables 2 and 4 show national estimates based on the highest wages. Text tables 1 and 2 show only healthcare occupations across all industries, while text table 3 and 4 show only the healthcare industry but includes both healthcare occupations and non-healthcare related occupations.

Text table 3 - Occupations in the healthcare industry (SIC 80) by largest employment

Occupational title	Employment	Hourly mean wage	Annual mean wage	Employment rank	Wage rank of 355
Registered nurses	1,846,810	\$21.43	\$44,580	1	82
Nursing aides, orderlies, and attendants	1,089,900	8.52	17,720	2	332
Licensed practical and licensed vocational nurses	559,140	13.80	28,710	3	211
Home health aides	273,790	9.25	19,240	4	319
Receptionists and information clerks	272,870	10.04	20,880	5	298
Medical assistants	264,020	10.84	22,540	6	275
Office clerks, general	253,330	10.03	20,870	7	299
Maids and housekeeping cleaners	241,270	7.85	16,320	8	347
Medical secretaries	232,400	11.53	23,990	9	253

Billing and posting clerks and machine operators	176,300	11.20	23,300	10	263
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Text table 4 - Occupations in the healthcare industry (SIC 80) by highest mean wage

Occupational title	Employment	Hourly mean wage	Annual mean wage	Employment rank	Wage rank of 355
Obstetricians and gynecologists	18,000	\$65.83	\$136,920	89	1
Surgeons	46,750	65.50	136,250	49	2
Internists, general	46,910	59.89	124,580	48	3
Anesthesiologists	25,570	59.65	124,060	78	4
Family and general practitioners	96,280	54.92	114,230	25	5
Pediatricians, general	18,630	54.51	113,380	88	6
Dentists	65,810	51.65	107,440	36	7
Podiatrists	3,890	50.42	104,880	165	8
Psychiatrists	12,690	50.11	104,230	108	9
Chief executives	23,650	46.49	96,690	82	10

Registered nurses

Looking solely at healthcare establishments at the national level, registered nurses is by far the occupation with the most employment. There are over 1.8 million registered nurses in the United States in the healthcare industry alone (text table 3). There are 2.2 million in the nation across all industries (text table 1), which is 1.73 percent of the national employment. The area/State with largest concentration of registered nurses is Washington, DC; 2.78 percent of the workers in DC are employed as registered nurses. West Virginia and Rhode Island have the second and third highest concentration of registered nurses among their workforce, with 2.58 percent and 2.48 percent respectively. When looking at employment data for this occupation at the metropolitan area level, however, these States are not represented. Columbia,

MO (4.66 percent) is the MSA with the largest percent of its workers employed as registered nurses, followed by Missoula, MT (4.14 percent) and Wheeling, WV-OH (4.07 percent). Registered nurses in Hawaii earn the highest wages at \$27.37 an hour. This is followed by California and New York with \$26.00 and \$24.46 an hour. Registered nurses in Santa Cruz-Watsonville, CA (\$29.67), Oakland, CA (\$29.65), and San Francisco, CA (\$29.54) receive the highest mean wages.

Nursing aides, orderlies, and assistants

The next largest healthcare occupation is nursing aides, orderlies, and attendants with just over one million in the healthcare industries, and 1.3 million in all industries combined. The employment in nursing aides, orderlies, and attendants accounts for 1.03 percent of the national cross-industry employment. North Dakota had 2.1 percent of its workers employed as nursing aides, orderlies, and assistants - the largest concentration in the US. South Dakota and Oklahoma follow with 1.84 percent and 1.73 percent respectively. Alexandria, LA (4.11 percent), Corpus Christi, TX (3.50 percent), and Texarkana, TX-AR (3.15 percent) are the MSAs with the largest percent of their workers employed as nursing aides, orderlies, and assistants.

Alaska (\$11.92), Connecticut (\$11.20), New York State (\$10.71), Nassau-Suffolk, NY (\$12.89), New York, NY (\$11.58), and Hartford, CT (\$11.52) are the States and MSAs with highest mean wages for this occupation.

Licensed practical and licensed vocational nurses

The third largest occupation for both cross-industry healthcare related occupations and all occupations in the healthcare industries is licensed practical and licensed vocational nurses. Nationally, there are 559,140 employed in the healthcare industries and 688,510 employed across all industries. The largest concentration of workers employed as licensed practical and licensed vocational nurses is found in Arkansas (1.16 percent). Other States with a large concentration of these workers include Louisiana (0.97 percent) and Oklahoma (0.95 percent). The States with the highest average wages for this occupation are Connecticut (\$18.95), California (\$17.18), and Massachusetts (\$17.13). Sherman-Denison, TX (1.98 percent) and Alexandria, LA (1.88 percent) are the MSAs with largest share of employment found in licensed practical and licensed vocational nurses. San Francisco, CA (\$20.40), New Haven-Meriden, CT

(\$19.75), and Bridgeport, CT's (\$19.47) licensed practical and licensed vocational nurses earn the highest wages.

Home health aides

Home health aides is the fourth largest occupation among the healthcare related occupations and is also the fourth largest occupation among all occupations found in the healthcare industries. The States with the largest percent of its workers employed as home health aides are New York (1.49 percent), Texas (0.92 percent), and Minnesota (0.78 percent). Connecticut (\$11.93), Alaska (\$11.35), and Texas (\$11.22) are the States where home health aides earn the highest wages. The MSA with the largest percent of its workers employed as home health aides is Beaumont-Port Arthur, TX (2.50 percent). New York, NY (1.20 percent) and Elmira, NY (1.26 percent) follow. Santa Rosa, CA has the highest mean wage for home health aides (\$13.69 an hour). New London-Norwich, CT and San Antonio, TX are second and third at \$13.02 and \$13.00 respectively.

Medical assistants

Medical assistants is the fifth largest occupation among cross-industry healthcare related occupations; there are 281,480 of them in the US. It is the sixth largest occupation in the

healthcare industries (SIC 80) with 264,020 workers employed in this occupation throughout the nation. The States with the largest share of total employment found in medical assistants are Hawaii (0.92 percent), Utah (0.45 percent), and Michigan (0.39 percent). The highest mean wages for medical assistants are found in Alaska (\$16.37 an hour), Connecticut (\$12.93 an hour), and California (\$12.73 an hour). The MSAs with the highest relative employment of medical assistants are Jackson, TN (1.15 percent), Greenville, NC (1.11 percent), and Gainesville, FL (1.05 percent). Anchorage, AK (\$16.67 an hour), Stamford-Norwalk, CT (\$16.29 an hour), and Reno, NV (\$15.46 an hour) are the MSAs where these workers receive the highest wages.

Medical and health service managers

Medical and health service managers is the sixth largest healthcare related occupation in the nation. There are 230,640 across all industries and 170,160 just in healthcare industries. The States with the largest relative employment of these workers are Washington, DC (0.39 percent), Maryland (0.37 percent), and Alaska (0.35 percent). The States where these workers receive the highest mean hourly wages are New Jersey (\$35.12), Connecticut (\$33.51), and Oregon (\$32.53). The MSAs that have the highest

relative employment are Alexandria, LA (0.76 percent), Topeka, KS (0.59 percent), and Bangor, ME (0.57 percent). The MSAs where Medical and health service managers earn the highest mean wages are Waterbury, CT (\$45.60), Fresno, CA (\$42.12), and Joplin MO (\$41.74).

Pharmacists

The seventh largest healthcare related occupation across all industries is pharmacists. In the healthcare industries alone there are 57,970 pharmacists; but across all industries there are 226,300. Many pharmacists are also found in miscellaneous retail establishments (SIC 59) and food stores (SIC 54). Hawaii (0.29 percent), West Virginia (0.285 percent), and Maryland (0.284 percent), respectively, have the largest percent of workers employed as pharmacists. California (\$33.54), Alaska (\$32.33), and Hawaii's (\$32.49) pharmacists earn the highest average wages. At the MSA level, Taxarkana, TX-AR (0.42 percent) followed closely by Tyler, TX (0.41 percent) have the largest share of their workers employed as pharmacists. Modesto, CA (\$35.47), Naples, FL (\$35.19), and Oakland, CA (\$34.81) have pharmacists with the highest average wages.

Highest wages

When it comes to wages among healthcare related occupations, it is no surprise that physicians and surgeons earn the most. Across all industries surgeons earn \$65.22 an hour. Obstetricians and gynecologists are a close second with \$65.11 an hour. Anesthesiologists are third at \$59.51 an hour. Looking at just the healthcare industries (SIC 80), obstetricians and gynecologists are at the top earning \$65.83 an hour. Surgeons are second with \$65.50 an hour and internists, general are third with \$59.89 an hour. Pediatricians, dentists, family and general practitioners, psychiatrists, podiatrists, and optometrists are also top earners.

Non-healthcare occupations

There are several non-healthcare occupations that are prevalent in the healthcare industry (SIC 80). In terms of employment, there are four occupations in the top ten that can be classified as non-healthcare related. Most are clerical in nature. These occupations are receptionists and information clerks; office clerks; maids and housekeeping cleaners; and billing and posting clerks. Switching to the top wage earners,

there is only one non-healthcare occupation among the top ten: chief executives, who earn \$46.49 an hour.

Detailed industry data

By looking at data at a more detailed industry level unique staffing patterns begin to emerge. Text tables 3 and 4 show the top ten occupations for each detailed industry. Text table 5 is by employment and text table 6 is by highest wages.

Offices of doctors of medicine (SIC 801)

In offices of doctors of medicine (SIC 801), the staffing pattern is comparable to the healthcare industry as a whole. Text tables 5 and 6 show the same nursing and clerical occupational mix as text table 3 and 4. One interesting exception is family and general practitioners. Usually only seen as one of the top wage earners, it appears here as the ninth largest occupation as well as the sixth highest earning occupation in offices of doctors of medicine.

Offices and clinics of dentists (SIC 802)

In offices and clinics of dentists (SIC 802) a more unique staffing pattern emerges. Dental occupations account for most of

the employment. The remaining occupations are clerical and administrative support. There are 157,800 dental assistants, 84,720 dental hygienists, and 60,800 dentists⁴ employed in America's dental offices. Surprisingly, dentists do not earn the most. The highest wage earners are surgeons, chief executives, and then dentists. There is also a variety of management occupations found among the large wage earners including, general and operations managers; financial managers; and medical and health services managers.

Nursing and personal care facilities (SIC 805)

Nursing and personal care facilities (SIC 805) employ 1.76 million workers. Over half of those workers are in one of the following three occupations: nursing aides, orderlies, and attendants; licensed practical and licensed vocational nurses; or registered nurses. Many of the remaining occupations are service workers, such as maids or food preparation workers.

Hospitals (SIC 806)

There are 1.28 million registered nurses working in hospitals (SIC 806) in the United States, more than three times the next

⁴ Many dentists are self-employed. The OES survey does not survey self-employed workers. Therefore the employment estimates for dentists may be smaller than the actual number of dentists in the US.

largest occupation - nursing aides, orderlies, and attendants with just under 350,000 workers. The third largest occupation is licensed practical and licensed vocational nurses. The fourth and fifth occupations with the largest employment are non-healthcare occupations: maids and housekeeping cleaners and office clerks, clerical. Obstetricians and gynecologists earn the highest wages in hospitals, followed by surgeons; internists, general; and psychiatrists. Non-healthcare occupations that emerge as high wage earners in the healthcare industries are chief executives and lawyers.

Medical and dental laboratories (SIC 807)

The largest occupations in medical and dental laboratories (SIC 807) in terms of employment include dental laboratory technicians (32,000), medical and clinical laboratory technologists (18,310), medical and clinical laboratory technicians (15,040), and radiologic technologists and technicians (11,880). Truck drivers, light or delivery service, billing and posting clerks, and couriers and messengers are also among the top ten occupations by employment.

Home healthcare services (SIC 808)

In home healthcare services (SIC 808) the largest employment is found in home health aides (213,990). Registered nurses, and personal and home care aides follow with employment of 108,310 and 83,740 respectively. Those earning the highest wages in this industry are internists, surgeons, chief executives, physical therapists, and pharmacists.

Text table 5 - Industry specific occupational estimates by largest employment

SIC	Occupational title	Employment	Hourly mean wage	Annual mean wage
<i>Offices and clinics of doctors of medicine</i>				
	Registered nurses	244,550	\$21.02	\$43,720
	Medical assistants	165,830	11.04	22,970
	Receptionists and information clerks	136,690	9.86	20,500
	Medical secretaries	104,670	11.70	24,340
	Licensed practical and licensed vocational nurses	88,180	13.21	27,470
	Billing and posting clerks and machine operators	87,350	11.30	23,510
	Office clerks, general	65,460	9.94	20,670
	Radiologic technologists and technicians	59,050	17.24	35,860
	Family and general practitioners	57,920	58.16	120,970
	Medical records and health information technicians	44,730	9.99	20,790
<i>Offices and clinics of dentists</i>				
	Dental assistants	157,800	11.59	24,110
	Dental hygienists	84,720	23.24	48,330
	Dentists	60,800	52.37	108,940
	Receptionists and information clerks	35,860	11.41	23,740
	Medical secretaries	24,470	12.56	26,130
	First-line supervisors/managers of office and administrative support workers	17,300	15.66	32,570
	Office clerks, general	14,730	10.44	21,720
	Billing and posting clerks and machine operators	8,900	11.78	24,500
	Bookkeeping, accounting, and auditing clerks	8,900	12.63	26,280
	Dental laboratory technicians	7,780	14.90	30,980
<i>Offices and clinics of doctors of osteopathy</i>				
	Medical assistants	7,650	10.00	20,800
	Receptionists and information clerks	5,330	9.47	19,700
	Registered nurses	3,950	18.44	38,360
	Family and general practitioners	3,690	58.45	121,570
	Medical secretaries	3,190	10.61	22,060
	Billing and posting clerks and machine operators	2,720	10.54	21,930
	Office clerks, general	2,270	8.79	18,280
	First-line supervisors/managers of office and administrative support workers	2,200	14.89	30,970
	Licensed practical and licensed vocational nurses	1,950	12.38	25,740
	File clerks	1,550	7.26	15,090

Offices and clinics of other health practitioners

Physical therapists	42,890	28.91	60,130
Receptionists and information clerks	21,210	8.98	18,680
Physical therapist assistants	20,090	16.56	34,440
Physical therapist aides	20,070	9.12	18,960
Occupational therapists	19,980	27.04	56,250
Medical assistants	19,220	9.84	20,470
Opticians, dispensing	18,650	11.05	22,980
Office clerks, general	18,590	9.35	19,440
Registered nurses	17,690	22.48	46,760
Medical secretaries	15,990	10.05	20,900

Nursing and personal care facilities

Nursing aides, orderlies, and attendants	659,980	8.31	17,290
Licensed practical and licensed vocational nurses	208,030	13.85	28,810
Registered nurses	150,230	19.22	39,970
Maids and housekeeping cleaners	100,150	7.46	15,510
Food preparation workers	61,750	7.46	15,510
Cooks, institution and cafeteria	50,090	8.41	17,490
Laundry and dry-cleaning workers	37,810	7.26	15,100
Food servers, nonrestaurant	30,140	7.61	15,840
Recreation workers	25,490	8.79	18,290
Janitors and cleaners, except maids and housekeeping cleaners	22,760	8.15	16,950

Hospitals

Registered nurses	1,280,510	21.82	45,380
Nursing aides, orderlies, and attendants	349,360	8.97	18,670
Licensed practical and licensed vocational nurses	200,030	13.79	28,670
Maids and housekeeping cleaners	126,420	8.16	16,980
Office clerks, general	119,760	10.30	21,420
Radiologic technologists and technicians	95,150	16.87	35,080
Medical and health services managers	93,050	28.81	59,930
Medical and clinical laboratory technologists	88,460	19.14	39,810
Healthcare support workers, all other	81,860	10.52	21,880
Secretaries, except legal, medical, and executive	78,120	11.58	24,080

Medical and dental laboratories

Dental laboratory technicians	32,000	13.89	28,900
Medical and clinical laboratory technologists	18,310	18.75	39,000
Medical and clinical laboratory technicians	15,040	12.54	26,090
Radiologic technologists and technicians	11,880	18.04	37,520
Healthcare support workers, all other	11,170	11.35	23,610
Truck drivers, light or delivery services	8,050	8.43	17,530
Billing and posting clerks and machine operators	6,720	11.01	22,900
Office clerks, general	6,110	9.48	19,710
Medical assistants	5,830	10.84	22,550
Couriers and messengers	5,770	8.60	17,890

Home health care services

Home health aides	213,990	9.41	19,570
Registered nurses	108,310	21.09	43,860
Personal and home care aides	83,740	7.11	14,780
Nursing aides, orderlies, and attendants	46,470	8.04	16,710
Licensed practical and licensed vocational nurses	43,460	15.13	31,470
Physical therapists	12,290	31.15	64,800
Medical and health services managers	9,010	25.64	53,320
Office clerks, general	8,330	9.43	19,610
Medical and public health social workers	5,830	20.40	42,430
General and operations managers	5,650	30.13	62,660

Miscellaneous health and allied services, not elsewhere classified

Registered nurses	39,060	20.63	42,920
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Mental health and substance abuse social workers	14,880	13.92	28,950
Medical assistants	12,620	10.48	21,800
Mental health counselors	12,000	14.35	29,840
Health professionals and technicians, all other	11,600	13.31	27,690
Licensed practical and licensed vocational nurses	10,810	13.74	28,580
Medical and clinical laboratory technicians	10,030	11.74	24,420
Social and human service assistants	9,950	10.80	22,470
Healthcare support workers, all other	9,770	10.26	21,340
Medical and health services managers	9,760	26.31	54,720

Text table 6 - Industry specific occupational estimates by highest mean wage

SIC	Occupational title	Employment	Hourly mean wage	Annual mean wage
<i>Offices and clinics of doctors of medicine</i>				
	Obstetricians and gynecologists	16,020	\$66.38	\$138,070
	Surgeons	40,420	66.17	137,640
	Anesthesiologists	19,150	64.13	133,400
	Internists, general	36,590	62.33	129,640
	Psychiatrists	2,400	60.92	126,720
	Family and general practitioners	57,920	58.16	120,970
	Pediatricians, general	14,110	57.00	118,560
	Podiatrists	1,070	53.05	110,340
	Chief executives	4,220	51.27	106,640
	Dentists	2,330	50.61	105,270
<i>Offices and clinics of dentists</i>				
	Surgeons	290	68.56	142,600
	Chief executives	260	54.44	113,240
	Dentists	60,800	52.37	108,940
	General and operations managers	2,690	31.47	65,460
	Dental hygienists	84,720	23.24	48,330
	Medical and health services managers	2,640	23.09	48,030
	Business operations specialists, all other	*	20.82	43,310
	Financial managers	1,380	19.89	41,380
	Human resources managers	120	18.65	38,780
	Administrative services managers	1,930	18.56	38,610
<i>Offices and clinics of doctors of osteopathy</i>				
	Surgeons	780	65.10	135,400
	Obstetricians and gynecologists	120	64.27	133,680
	Internists, general	540	61.69	128,310
	Family and general practitioners	3,690	58.45	121,570
	Anesthesiologists	570	54.97	114,330
	Pediatricians, general	250	53.07	110,380
	Chief executives	30	52.50	109,200
	Health diagnosing and treating practitioners, all other	1,000	48.76	101,420
	Chiropractors	*	40.97	85,220
	Podiatrists	*	37.88	78,790
<i>Offices and clinics of other health practitioners</i>				
	Surgeons	380	68.76	143,010
	Internists, general	240	61.35	127,600
	Family and general practitioners	1,130	55.00	114,400
	Podiatrists	2,390	52.56	109,330
	Chief executives	1,000	46.46	96,630
	Dentists	110	41.11	85,500
	Optometrists	10,940	37.17	77,310
	Chiropractors	10,580	33.88	70,480

Pharmacists	550	33.42	69,510
Psychiatrists	2,230	33.16	68,970

Nursing and personal care facilities

Family and general practitioners	300	57.24	119,070
Psychiatrists	60	53.36	110,990
Internists, general	220	49.06	102,040
Dentists	60	48.79	101,490
Surgeons	*	44.79	93,150
Pediatricians, general	*	42.83	89,090
Chief executives	5,160	36.81	76,550
Optometrists	80	29.86	62,110
Pharmacists	430	29.40	61,150
General and operations managers	10,680	28.27	58,790

Hospitals

Obstetricians and gynecologists	1,580	60.90	126,680
Surgeons	4,330	60.20	125,210
Internists, general	8,320	49.75	103,480
Psychiatrists	5,890	49.72	103,410
Chief executives	8,700	49.48	102,920
Family and general practitioners	30,500	48.53	100,930
Pediatricians, general	3,700	45.84	95,350
Anesthesiologists	5,470	45.46	94,570
Lawyers	350	42.61	88,620
Physicists	260	41.74	86,830

Medical and dental laboratories

Family and general practitioners	350	64.87	134,920
Surgeons	80	63.88	132,880
Internists, general	280	61.27	127,440
Health diagnosing and treating practitioners, all other	3,350	50.97	106,020
Chief executives	710	49.10	102,130
Sales managers	250	44.43	92,410
Orthotists and prosthetists	*	40.70	84,660
Clinical, counseling, and school psychologists	*	37.30	77,580
Computer and information systems managers	260	35.70	74,250
Pharmacists	*	33.43	69,540

Home health care services

Internists, general	60	59.01	122,740
Surgeons	*	53.99	112,300
Chief executives	1,950	44.73	93,030
Physical therapists	12,290	31.15	64,800
Pharmacists	1,500	30.48	63,390
General and operations managers	5,650	30.13	62,660
Clinical, counseling, and school psychologists	160	30.04	62,470
Occupational therapists	4,340	29.72	61,810
Computer and information systems managers	560	27.34	56,870
Speech-language pathologists	2,390	26.77	55,670

Miscellaneous health and allied services, not elsewhere classified

Obstetricians and gynecologists	220	64.68	134,540
Psychiatrists	2,090	56.79	118,120
Surgeons	360	55.32	115,070
Pediatricians, general	360	54.86	114,100
Internists, general	650	53.88	112,070
Family and general practitioners	2,050	52.33	108,850
Industrial-organizational psychologists	30	48.89	101,690
Chief executives	1,630	48.38	100,620
Lawyers	60	45.61	94,880
Dentists	400	42.47	88,330

Conclusions

This article has highlighted some of the occupations with the largest employment found in the healthcare industry, showcasing both the areas that have the highest concentration of those workers and the areas where healthcare workers receive the highest wages. In addition, the occupational content of several of the smaller detailed industries has been discussed. Additional data for healthcare occupations, as well as additional industry data can be obtained from the OES website at <http://stats.bls.gov/oeshome.htm>.

Occupational employment and wages by State

Douglas K. Himes

The Occupational Employment Statistics (OES) program produces cross-industry estimates of occupational employment and wages for every State and the District of Columbia (as well as other areas). These estimates are calculated with data collected from employers of all sizes, in all industry divisions, in metropolitan and non-metropolitan areas. As one would expect, the estimates for a given occupation vary from one State to another. By comparing every State's estimates for a given occupation we can identify the State with the most employment and highest wages for that occupation. Certain states are ranked first in occupational employment or wages for many occupations and the majority of States are ranked first in occupational employment or wages for at least one occupation.

States ranked first in Occupational Employment

Text table 1, Occupational Employment, shows occupational employment and wage estimates and the State wage rank for selected States where, for a given occupation, the occupational employment estimate is greater than that of any other State. For States that have more than one occupation ranked first in occupational

employment, the occupation selected for inclusion in this table is generally that with the highest employment. The State wage rank shows where the State is ranked among other States in occupational wages for the same occupation. Over thirty States are ranked first in occupational employment in at least one occupation. Most of those are ranked first in ten or fewer occupations. Some States are not ranked first in occupational employment for any occupation. The States with the largest population are ranked first in many occupations: Florida is ranked first in 26 occupations, Pennsylvania in 27, New York in 59, Texas in 70, and California in 392. A State's being ranked number one in occupational employment for a given occupation does not mean that the State will be ranked number one in occupational wages for the same occupation.

Text table 1 Occupational employment

State	Occupation title	Employment	Mean annual wage	State wage rank
AL	Meat, poultry, and fish cutters and trimmers	17,160	\$15,530	27
AZ	Helpers—brickmasons, blockmasons, stonemasons, and tile and marble setters	4,730	20,050	32
CA	Retail salespersons	390,300	20,160	9
CO	Health specialties teachers, postsecondary	8,670	53,300	19
FL	Hairdressers, hairstylists, and cosmetologists	25,000	20,870	14
GA	Flight attendants	13,320	41,060	6
HI	Commercial divers	60	33,210	1
IL	Mixing and blending machine setters, operators, and tenders	12,320	25,670	23
IN	Molders, shapers, and casters, except metal and plastic	4,300	24,080	14
IA	Timing device assemblers, adjusters, and calibrators	1,300	21,790	6
KY	Continuous mining machine operators	1,670	31,860	4
LA	Sailors and marine oilers	5,660	19,650	16
ME	Fallers	830	26,340	5
MD	Atmospheric and space scientists	840	63,310	3

MA	Social work teachers, postsecondary	500	45,170	9
MI	Tool and die makers	24,020	44,490	2
MO	Coaches and scouts	5,450	34,630	17
NV	Gaming dealers	24,400	12,320	13
NJ	Service station attendants	11,320	15,290	34
NY	Home health aides	122,720	18,100	12
NC	Textile winding, twisting, and drawing out machine setters, operators, and tenders	28,170	21,800	7
OH	Cutting, punching, and press machine setters, operators, and tenders, metal and plastic	34,450	24,630	14
OK	Wellhead pumpers	1,140	32,200	4
PA	Emergency medical technicians and paramedics	14,240	20,370	36
SC	Forestry and conservation science teachers, postsecondary	500	52,750	5
TN	Foundry mold and coremakers	3,260	25,160	10
TX	Truck drivers, heavy and tractor-trailer	122,740	31,460	25
WA	Ship engineers	870	50,080	5
WV	Mine cutting and channeling machine operators	100	37,870	1
WI	Paper goods machine setters, operators, and tenders	10,730	31,260	4
PR	Shoe machine operators and tenders	3,790	12,040	11

States ranked first in occupational wages

Text table 2, Occupational Wages, shows examples of occupational wage and employment estimates, and State employment rank, for States where, for a given occupation, the occupational wage estimate is greater than that of any other State. The State employment rank shows where the State is ranked among other States in occupational employment for the same occupation. Over forty States are ranked first in occupational wages in at least one occupation; a few States are not ranked first in occupational wages for any occupation. Most States are ranked first in ten or fewer occupations. The States with the most occupations ranked first in occupational wages are: Connecticut, ranked first for 39 occupations; New York, for 50; California, for 55; New Jersey, for

70; and Alaska, for 73. For States that have more than one occupation ranked first in occupational wages, the occupation selected for inclusion in this table is generally that with the highest employment. A State's being ranked number one in occupational wages for a given occupation does not mean that the State will be ranked number one in occupational employment for the same occupation.

Text table 2 Occupational Wages

State	Occupation title	Mean annual wage	Employment	State employment rank
AL	Extruding, forming, pressing, and compacting machine setters, operators, and tenders	\$30,680	890	25
AK	Retail salespersons	22,740	8,070	50
AZ	Electrical engineers	71,130	3,560	14
AR	Gas compressor and gas pumping station operators	45,050	120	8
CA	Customer service representatives	29,540	199,250	1
CO	Sales representatives, wholesale and manufacturing, technical and scientific products	67,780	4,930	26
CT	Home health aides	24,810	12,740	12
DE	Truck drivers, light or delivery services	28,220	2,690	47
DC	Secretaries, except legal, medical, and executive	32,110	15,820	34
FL	Obstetricians and gynecologists	145,020	2,090	2
GA	Computer software engineers, applications	82,130	10,470	8
HI	Maids and housekeeping cleaners	22,790	9,900	33
ID	Fallers	56,430	540	3
IL	Team assemblers	26,300	58,720	8
IN	Boilermakers	47,230	910	6
IA	Food batchmakers	27,510	1,410	13
KY	Aircraft mechanics and service technicians	51,770	1,290	22
LA	Chemical plant and system operators	47,250	4,270	3
ME	Clinical, counseling, and school psychologists	63,460	530	33
MD	First-line supervisors/managers of food preparation and serving workers	31,540	8,820	24
MA	Tellers	21,260	13,440	9
MI	Industrial truck and tractor operators	34,050	28,680	5
MN	Automotive body and related repairers	45,530	5,070	12
MS	Gaming supervisors	40,190	1,780	2

MO	Mechanical engineering technicians	49,810	700	23
NV	Taxi drivers and chauffeurs	24,420	7,630	4
NH	Management analysts	79,550	2,370	27
NJ	Elementary school teachers, except special education	49,780	50,230	8
NM	Amusement and recreation attendants	23,110	780	40
NY	Janitors and cleaners, except maids and housekeeping cleaners	23,450	188,600	2
NC	Upholsterers	29,410	9,580	1
ND	Gaming and sports book writers and runners	17,140	300	5
OH	Loan interviewers and clerks	32,620	4,410	12
OK	Geoscientists, except hydrologists and geographers	77,640	570	9
PA	English language and literature teachers, postsecondary	54,500	4,590	2
RI	Financial managers	86,940	1,430	45
SC	Cementing and gluing machine operators and tenders	31,950	1,350	8
TN	Coaches and scouts	56,370	650	32
TX	Mechanical engineers	63,290	19,250	2
UT	Computer, automated teller, and office machine repairers	39,480	1,700	25
VT	Medical records and health information technicians	32,040	470	47
VA	Airline pilots, copilots, and flight engineers	138,600	5,140	3
WA	Dental hygienists	65,870	3,600	6
WV	Roof bolters, mining	43,160	770	2
WI	Internists, general	140,260	1,070	13
WY	Wellhead pumpers	41,820	710	2
VI	Cargo and freight agents	34,310	30	36

States ranked first in both Occupational Employment and Wages

In most cases, occupations that are ranked first in occupational employment are not ranked first in occupational wages, and vice-versa. The entries on text table 3, Occupational Employment and Wages, are those cases where, for a given occupation, the States' occupational employment estimates and occupational wage estimates are both ranked first--higher than the employment estimates and higher than the wage estimates in any other State. In this table States with large populations are predominant.

Text table 3 Occupational Employment and Wages

State	Occupation title	Employment	Mean annual wage
CA	Network systems and data communications analysts	11,350	\$67,360
CA	Aerospace engineers	19,100	68,960
CA	Astronomers	170	72,170
CA	Environmental scientists and specialists, including health	5,860	58,990
CA	Hydrologists	670	67,870
CA	Market research analysts	7,830	64,690
CA	Industrial-organizational psychologists	110	89,010
CA	Nuclear technicians	820	63,240
CA	Probation officers and correctional treatment specialists	12,580	49,840
CA	Paralegals and legal assistants	18,910	46,760
CA	Producers and directors	5,970	83,440
CA	Technical writers	6,850	57,980
CA	Camera operators, television, video, and motion picture	2,620	46,460
CA	Pharmacists	23,170	69,760
CA	Occupational therapists	9,080	61,160
CA	Physical therapists	13,600	65,720
CA	Medical and clinical laboratory technologists	18,610	49,380
CA	Diagnostic medical sonographers	2,810	52,660
CA	Nuclear medicine technologists	1,810	54,370
CA	Psychiatric technicians	8,690	33,160
CA	Occupational therapist aides	1,060	33,460
CA	Court, municipal, and license clerks	10,510	33,320
CA	Customer service representatives	199,250	29,540
CA	Postal service mail carriers	38,680	37,970
CA	Medical secretaries	22,450	28,920
CA	Farm labor contractors	7,020	18,880
CA	Construction and building inspectors	5,720	52,940
CA	Fence erectors	2,200	27,290
CA	Radio mechanics	540	40,510
CA	Commercial pilots	3,310	78,660
CA	Locomotive engineers	2,280	60,300
CA	Railroad conductors and yardmasters	3,750	56,350
FL	Agricultural sciences teachers, postsecondary	1,060	68,870
HI	Commercial divers	60	33,210
IL	Brickmasons and blockmasons	8,600	57,230
IL	Avionics technicians	950	47,640
IL	Rail car repairers	1,830	38,020
IL	Signal and track switch repairers	140	43,920
MD	Political scientists	90	54,560
MI	Mechanical drafters	6,370	51,470
MI	Model makers, metal and plastic	2,750	53,400
MI	Welding, soldering, and brazing machine setters, operators, and tenders	7,690	35,960
NY	Credit analysts	7,530	53,930
NY	Financial examiners	3,380	79,840
NY	Mathematical technicians	240	60,280
NY	Fashion designers	4,280	59,600
NY	Dancers	1,680	48,640
NY	Locker room, coatroom, and dressing room attendants	4,510	27,580

NY	First-line supervisors/managers of non-retail sales workers	30,480	81,920
NY	Securities, commodities, and financial services sales agents	43,100	95,790
NY	Elevator installers and repairers	3,200	60,790
NY	Telecommunications line installers and repairers	29,380	48,770
NC	Upholsterers	9,580	29,410
PA	Foreign language and literature teachers, postsecondary	2,210	58,660
PA	Fish and game wardens	1,200	73,050
PA	Medical appliance technicians	720	32,330
TX	Models	800	27,830
TX	Rotary drill operators, oil and gas	3,540	38,240
TX	Semiconductor processors	9,820	28,320
VA	Geographers	100	54,530
VA	Nuclear power reactor operators	340	53,740
WV	Mine cutting and channeling machine operators	100	37,870

For information and analysis of selected occupational employment and wages by metropolitan area, see *Relative Employment and wages by Metropolitan Area* by Ben Cover, and *Service Occupations in Selected Metropolitan Areas* by Rebecca Shaw in this publication.

Relative Employment and Wages by Metropolitan Area

Ben Cover

The Occupational Employment Statistics (OES) program of the BLS produces employment and wage data including data for 334 metropolitan statistical areas (MSA), an area around and including a large city. The data are classified according to the Standard Occupational Classification System (SOC). This system consists of 22 major occupational groups, which can further be aggregated to an intermediate-level (11 groups), or a higher-level of six groups of occupations⁵: management, professional, and related; service; sales and office; natural resources, construction, and maintenance; production, transportation and material moving.

This article explores relative employment and wages in metropolitan areas. Relative employment is defined as the employment per occupational group divided by total MSA employment.

Graph A displays relative employment in metropolitan areas with occupations aggregated to the highest level. The graph displays the distribution of employment for the five metropolitan areas with the highest relative employment in one of the five occupational groups. For example, Atlantic-Cape May, NJ is the MSA with the highest relative employment for service occupations; 39 percent of its workers are employed in this occupational group.

The other four aggregated groups account for the remaining 61 percent.

Text table 1 shows the five MSAs with the highest wages for each of the 22 major occupational groups. For example, the occupational group legal occupations shows the areas with the highest average wage is Pittsfield, MA (\$51.70), followed by New York, NY (\$45.96), Dothan, AL (\$44.92), Boston, MA-NH (\$44.18), and Miami, FL (\$44.11). The annual salary is given as well as the hourly wage².

INSERT GRAPH 1 HERE

MSA Relative Employment

Corvallis, OR, has the highest percentage of workers in management, professional, and related occupations; 44 percent of its workers are employed in this occupational group. Electrical and electronic engineering technicians account for 12 percent of the management, professional, and related occupations.

Tallahassee, FL, and Gainesville, FL, have the second and third largest percentage of management, professional, and related occupations with 40 and 39 percent, respectively.

Atlantic-Cape May, NJ, has the highest percentage of workers in service occupations; 39 percent of its workers are employed in this occupational group. Personal care and service occupations

⁵ Military occupations are surveyed by the OES survey and are therefore not included in this paper.

² Using the annual wage as well as hourly accommodates occupations such as teachers and pilots, where an hourly wage is difficult to determine because these workers do not have standard work schedules.

account for 27 percent of the service occupations in Atlantic-Cape May--much higher than the national average of 11 percent. Most of the personal care and service occupations are gaming related occupations. Atlantic City has a large number of gambling establishments and is one of the few place where gambling is legal on the East Coast. Interestingly, Las Vegas, NV-AZ, another area known for gambling, is the MSA with the second highest percentage of workers in service occupations. Like Atlantic City, in Las Vegas, personal care and service occupations account for the largest percentage of the service occupations and gaming related occupations comprise most of the personal care and service occupations. Elkhart-Goshen, IN, has the lowest percentage of workers in service occupations; 10 percent of its workers are employed in this occupational group.

Sarasota-Bradenton, FL, has the highest percentage of workers in sales and office occupations; 36 percent of its workers are employed in this occupational group. Retail salespersons account for 9 percent of the sales and office occupations in Sarasota-Bradenton. Jersey City, NJ, has the second highest percentage of workers in sales and office occupations at 35 percent. Office and administrative support occupations account for 71 percent of the sales and office occupations in Jersey City compared to the national average of 64 percent. Elkhart-Goshen, IN has the lowest

percentage of workers in sales and office occupations; 18 percent of its workers are employed in this occupational group.

Yuma, AZ, has the highest percentage of workers in natural resources, construction, and maintenance occupations; 30 percent of its workers are employed in this occupational group. Farming, fishing, and forestry occupations account for 65 percent of the natural resources, construction, and maintenance occupations in Yuma compared to the national average of 4 percent. Farmworkers and laborers, crop, nursery, and greenhouse account for 42 percent of farming, fishing, and forestry occupations in Yuma. Visalia-Tulare-Porterville, CA has the second highest percentage of workers in natural resources, construction, and maintenance occupations at 25 percent, while Jersey City, NJ has the fewest at 5 percent.

Elkhart-Goshen, IN, is the MSA with the highest percentage of workers in production, transportation, and material moving; 45 percent of its workers are employed in this occupational group. Production occupations account for 83 percent of production, transportation, and material moving occupations in Elkhart-Goshen compared to the national average of 57 percent. Hickory-Morganton-Lenoir, NC, has the second highest percentage of workers in production, transportation, and material moving occupations at 40 percent and Fort Smith, AR-OK has the third highest at 32 percent. Santa Fe, NM, has the lowest percentage of workers in

production, transportation, and material moving occupations at 6 percent.

INSERT TEXT TABLE 1 HERE

MSA Wages

Text table 1 shows that in many cases, MSAs in the Northeast region of the United States have the highest wages. For example, MSAs located in the State of New York are included in the top five paying areas for 11 of the 22 major occupational groups. MSAs in Connecticut also have high wages: MSAs located there are included in the top five paying areas for 8 of the 22 major occupational groups.

Some metropolitan areas have one occupational group where their average salaries are among the highest. Average salaries in Washington, D.C. are highest for only life, physical, and social science occupations. Workers in this occupational group make a mean wage of \$29.72 per hour, the third highest salary in the country for life, physical, and social science occupations. In the Washington, D.C. MSA, the zoologists and wildlife biologists contribute to the high average salary for life, physical, and social science occupations: the average wage there is \$31.97 compared to the national average of \$20.87. Average salaries for occupations in Augusta-Aiken, GA-SC are highest for only one occupational group: architecture and engineering occupations. Workers in this occupational group make \$32.16 per hour, the third highest salary in the country for architecture and engineering

occupations. Within this occupational group, mechanical engineers have the highest mean hourly wage--\$35.91.

Other States have the distinction of having the two highest paying metropolitan areas for an occupational group. In California, Santa Cruz-Watsonville and San Jose are the top two paying MSAs for computer and mathematical occupations at \$35.40 and \$33.62. In Florida, Gainesville and Tallahassee are the top two paying MSAs for education, training, and library occupations at \$25.21 and \$24.01. In New York, New York City and Nassau-Suffolk are the top two paying MSAs for building and grounds cleaning and maintenance occupations at \$13.17 and \$12.74.

The data OES produces can show many interesting variations in occupational employment and wages. Certain areas of the United States employ more of a certain kind of workers. Likewise, some areas pay higher than other areas. For further information, contact the OES information request line at (202)-691-6569 or look on the website at <http://stats.bls.gov/>.

Service Occupations in Selected Metropolitan Areas

Rebecca Shaw

A common theme in current economic literature is the growth of service occupations in recent years. The United States economy is no longer predominantly production based, as the demand for services has risen in the latter half of the twentieth century. In 1999, the service industry accounted for 33.8 percent of the total employment in the private sector, while the manufacturing industry only accounted for 17.2 percent.⁶ These numbers represent a significant change in the make up of the American economy, and the goal of this paper is to provide a more detailed look at the employment and wages of the growing service occupations for selected U.S. metropolitan areas.

The selection of the metropolitan areas presented in this paper was based on traditional notions of "white collar" and industrial. The traditionally "industrial", or cities that are known for being production intense in output, studied in this paper include: Detroit, Milwaukee, and Pittsburgh. For contrast, this paper also studies the economies of Los Angeles, New York City, and Washington DC, which are less production oriented. Employment and wage estimates from the Occupational Employment

⁶ Covered Employment and Wages Press Release, November 11, 2000. Bureau of Labor Statistics.

Statistics (OES) survey for each of the selected metropolitan areas are provided, as well as for the nation as a whole.

The selected service occupations (approximately 80 occupations) were chosen from the Standard Occupational Classification structure, and include healthcare support, protective service, food preparation and serving, building and grounds cleaning and maintenance, and personal care occupations. Healthcare support includes such occupations as home health aides, massage therapists, and veterinary assistants. Protective service is comprised of occupations such as fire fighters and animal control officers, as well as their supervisors. Food preparation and serving includes several different classifications of cooks, as well as other occupations commonly found in restaurants. Building and grounds cleaning and maintenance includes janitors and maids, as well as their supervisors. Personal care contains the most variety of occupations, from gaming workers and tour guides to manicurists and aerobics instructors. A study of the Standard Occupational Classification System may show that other occupations surveyed by OES are of a service nature, but only those classified under "Service Occupations" are included in this paper.⁷

⁷ Standard Occupational Classification Manual, 2000.

Service Occupations in Selected Metropolitan Areas is based around the study of the employment and wage estimates provided, as they are able to provide a view of the magnitude of the service industry as a whole. The largest employing and highest paying service occupations are provided for each area, as well as the percent of service employment as a share of all occupations in the area. All of the data are provided for the U.S. economy as a whole, in order to study the data not only by area, but also as a nation. This way the relative employment of the service occupations can be measured by area.

Service Occupations in the Nation

The statistics describing the growth of the service sector in the economy, included in the introduction to this paper, referred to the nation as a whole. Table 1 lists the 80 occupations that have been classified as "service occupations", and includes the total employment, the percentage share of employment the occupation holds compared to all surveyed occupations, and the hourly mean wage.

National employment for all surveyed occupations is approximately 127,274,000, with the selected service occupations comprising 16.9% of the total employment surveyed by the

Occupational Employment Statistics program. The employment for service occupations on a national scale ranges from 1,170 employed as makeup artists to 2,090,560 employed as janitors and cleaners. Nationally, janitors and cleaners represent 1.64 percent of employment in all reported occupations, and waiters and waitresses account for 1.6 percent of all reported employment (text table 1).

Text table 1. Top ten service occupations by employment for the nation, 1999

Occupation	Employment	Percent of service occupations represented in national total	Hourly mean wage
Janitors and cleaners, except maids and housekeeping cleaners	2,090,560	1.6426	\$ 8.76
Waiters and waitresses	2,039,950	1.6028	6.46
Combined food preparation and serving workers, including fast food	1,950,970	1.5329	6.64
Nursing aides, orderlies, and attendants	1,308,740	1.0283	8.59
Security guards	1,088,470	.8552	8.95
Maids and housekeeping cleaners	913,470	.7177	7.46
Food preparation workers	878,650	.6904	7.57
Landscaping and groundskeeping workers	739,460	.5810	9.32
Cooks, restaurant	656,540	.5159	8.52
Police and sheriff's patrol officers	581,860	.4572	18.61

Text table 2 shows the mean wage for service occupations ranges from the \$6.46 per hour for waiters and waitresses to \$26.01 per hour for first line supervisors of police and detectives. First line supervisors account for the two highest paying service sector occupations, with detectives and criminal investigators ranking third at \$22.90 per hour. Nine of the ten highest paying occupations are classified as protective service occupations. Text table 2 shows that protective service

occupations appear to earn the highest wages, but the largest shares of employment are much more varied among the occupational classifications.

Text table 2. Top ten service occupations by wage for the nation, 1999

Occupation	Employment	Percent of service occupations represented in national total	Hourly mean wage
First line supervisors of police and detectives	111,600	.0877	\$ 26.01
First line supervisors of fire fighting and prevention workers	57,300	.0450	23.60
Detectives and criminal investigators	83,340	.0655	22.90
Transit and railroad police	4,590	.0036	20.32
First line supervisors of correctional officers	28,300	.0222	20.30
Fish and game wardens	8,220	.0065	20.16
Fire inspectors and investigators	10,050	.0079	19.98
Police and sheriff's patrol officers	581,860	.4572	18.61
Gaming supervisors	26,890	.0211	16.96
Fire fighters	252,730	.1986	16.38

Four of the top ten occupations with the largest employment are classified as food preparation and serving occupations, and three of the top ten occupations are classified as building and grounds cleaning and maintenance (text table 1). The top ten highest paying occupations do not command nearly as large a share of national employment; the largest is police and sheriff's patrol officers, with 0.46 percent, while the second largest, fire fighters, drops down to 0.2 percent.

While it is important to study the size and scope of service occupations on a national scale, the impact can be measured better at a more detailed level - the metropolitan statistical area. The Occupational Employment Statistics survey covers 121,274,000 people at the national level, while the largest metropolitan area used in this study is Los Angeles, which has approximately 3,860,400 people included in the OES survey. The statistics become much more descriptive at this level.

Service Occupations in the Detroit Metropolitan Area

Detroit is one of the traditional industrial towns, where one might expect to have a lower percentage of service occupations. The total estimated employment for Detroit is approximately 1,902,770, with employment in the service sector accounting for 266,800 workers, or 14 percent of all reported employment. Within the service occupations, the employment ranges from 60 parking enforcement workers to 42,430 waiters and waitresses (text table 3). Waiters and waitresses account for 0.28 percent of the employment for all of Detroit.

Text table 3. Top ten service occupations by employment for the Detroit metropolitan area, 1999

Occupation	Employment	Percent of service employment as a share of total employment	Hourly mean wage
Waiters and Waitresses.....	42,430	.2719	\$ 6.27

Janitors and cleaners, except maids and housekeeping cleaners.....	29,490	.1890	10.86
Nursing aides, orderlies, and attendants.....	15,910	.1020	9.68
Security guards.....	11,740	.0752	9.22
Dishwashers.....	11,100	.0711	7.72
Cooks, restaurant.....	10,920	.0700	8.57
Medical assistants.....	10,660	.0683	10.60
Home health aides.....	10,340	.0663	9.17
Landscaping and groundskeeping workers.....	10,220	.0655	9.79
Child care workers.....	9,890	.0634	8.17

Within the ten service occupations with the largest number of employees, occupations classified as healthcare support and food serving and preparation are each represented three times. Personal care and building and grounds cleaning and maintenance classifications each have two occupations in the top ten. None of the occupations with the largest employment are paid over \$10.86 per hour (text table 3).

While the service occupations with the largest employment are not compensated highly, text table 4 shows the occupations receiving the highest wages. Of the ten, nine are classified as protective service occupations and one is classified as food preparation and serving. First line supervisors of police and detectives is the service occupation with the highest mean wage, earning \$28.77 per hour. Fire inspectors and investigators are ranked third, as the first non-supervisory occupation, and are estimated to earn \$22.71 per hour.

Text table 4. Top ten service occupations by wage for the Detroit metropolitan area, 1999

Occupation	Employment	Percent of service employment as a share of total employment	Hourly mean wage

First line supervisors of police and detectives.....	1,820	.0117	\$ 28.77
First line supervisors of fire fighting and prevention workers.....	650	.0042	25.50
Fire inspectors and investigators.....	*	.6409	22.71
First line supervisors of correctional officers.....	330	.0021	22.40
Fish and game wardens.....	*	.0002	20.86
Police and sheriff's patrol officers.....	9,600	.0615	19.81
Fire fighters.....	3,390	.0217	18.39
Chefs and head cooks.....	*	.6409	16.50
First line supervisors of personal service workers.....	1,580	.0101	16.39
Animal control workers.....	*	.6409	15.85

When the wage estimates for Detroit are compared to the national estimates, it is apparent that the ten highest paying occupations are quite similar, and, in certain instances, the same. Even though Detroit was selected for this study for its blue collar reputation, the percent of service employment (14 percent) is only slightly less than the national share (16.9 percent).

Service Occupations in the Milwaukee Metropolitan Area

The second industrial metropolitan area selected for this study is Milwaukee. Total employment for the Milwaukee area is approximately 846,800, and service occupations make up 15.9 percent of the total. Combined food preparation and serving workers has the largest number of employees, but with only 19,480 (text table 5), this is significantly less than the largest employing occupation in Detroit (42,430 employed as waiters and waitresses). At 19,480, combined food preparation and serving workers only represents 0.13 percent of the total employment for the area. Home health aides, ranked tenth in the top employing service occupations, only represents 0.03 percent of the total

employment in the area. Once again the percentage share of service occupations in a traditional industrial area does not differ significantly from the national percentage. Although, the two top paying occupations in Milwaukee both pay more than the National average.

Text table 5. Top ten service occupations by employment for the Milwaukee metropolitan area, 1999

Occupation	Employment	Percent of service employment as a share of total employment	Hourly mean wage
Combined food preparation and serving workers, including fast food.....	19,480	.1253	\$ 7.09
Janitors and cleaners, except maids and housekeeping cleaners.....	18,310	.1178	8.50
Waiters and waitresses.....	14,040	.0903	6.24
Nursing aides, orderlies, and attendants.....	12,210	.0785	9.12
First line supervisors of food preparation and serving workers.....	5,250	.0338	11.76
Maids and housekeeping cleaners.....	4,240	.0273	7.46
Cooks, fast food.....	4,200	.0270	6.76
Food preparation workers.....	4,100	.0263	7.64
Landscaping and groundskeeping workers.....	4,070	.0262	10.61
Home health aides.....	3,940	.0254	8.80

Text table 6 presents the wage estimates for the ten highest paying service occupations. The mean wage for service occupations in Milwaukee ranges from \$6.24 per hour for waiters and waitresses to \$27.28 per hour for first line supervisors of police and detectives. The top ten paying occupations lists detectives and criminal investigators as second highest, at \$24.08 per hour. Of the highest paying occupations, five are classified as protective service, while the rest are varied.

Text table 6. Top ten service occupations by wage for the Milwaukee metropolitan area, 1999

Occupation	Employment	Percent of service employment as a share of total employment	Hourly mean wage
First line supervisors of police and detectives.....	570	.0036	\$ 27.28
Detectives and criminal investigators.....	910	.0058	24.08
Fire fighters.....	2,870	.0185	17.26
Physical therapist assistants.....	*	.6432	17.19
Animal control workers.....	80	.0005	17.13
First line supervisors of landscaping, lawn service, and groundskeeping workers.....	450	.0029	16.32
Occupational therapist assistants.....	80	.0005	15.22
First line supervisors of personal service workers.....	500	.0032	14.06
Fitness trainers and aerobics instructors.....	2,020	.0130	12.49
Private detectives and investigators.....	190	.0012	12.03

Service Occupations in the Pittsburgh Metropolitan Area

The last industrial area reviewed for this study is Pittsburgh. Total employment for the entire Pittsburgh area is approximately 963,210, with employment in service occupations accounting for 17.9 percent of that total, the highest percentage of the cities included in this paper. Janitors and cleaners employ the largest number in the service sector, with 17,450, or 0.11 percent of the total occupations reported in the Pittsburgh area. Occupations classified as food preparation and serving command the greatest share of employment, with four occupations listed in the top ten (text table 7). Three of the occupations in text table 7 are classified as building and grounds cleaning and maintenance.

Text table 7. Top ten service occupations by employment for the Pittsburgh metropolitan area, 1999

Occupation	Employment	Percent of service employment as a share of total employment	Hourly mean wage
Janitors and cleaners, except maids and housekeeping cleaners.....	17,450	.1114	\$ 8.78
Waiters and waitresses.....	16,240	.1037	6.06
Combined food preparation and serving workers, including fast food.....	15,510	.0990	6.32
Nursing aides, orderlies, and attendants.....	15,360	.0980	8.89
Maids and housekeeping cleaners.....	8,630	.0551	7.54
Food preparation workers.....	7,610	.0486	7.09
Cooks, institution and cafeteria.....	7,590	.0485	9.16
Police and sheriff's patrol officers.....	7,060	.0451	19.04
Landscaping and groundskeeping workers.....	6,150	.0393	9.03
Security guards.....	5,930	.0379	8.40

Text table 8 lists the wage estimates of the service occupations for the metropolitan area, showing mean wages from \$6.00 per hour for tour guides and escorts to \$37.54 per hour for fish and game wardens. Detectives and criminal investigators is ranked second, at \$27.60 per hour. Unlike the other two industrial areas studied, first line supervisors is ranked third, as opposed to first, at \$25.08 per hour. Seven of the ten highest paying occupations are classified as protective service occupations.

Text table 8. Top ten service occupations by wage for the Pittsburgh metropolitan area, 1999

Occupation	Employment	Percent of service employment as a share of total employment	Hourly mean wage
Fish and game wardens.....	130	.0008	\$ 37.54
Detectives and criminal investigators.....	460	.0030	27.60
First line supervisors of police and detectives.....	640	.0041	25.08
Police and sheriff's patrol officers.....	7,060	.0451	19.04
Private detectives and investigators.....	140	.0009	19.01

Fire inspectors and investigators.....	*	.6384	17.25
First line supervisors of correctional officers.....	70	.0004	16.57
Pest control workers.....	*	.6384	15.57
Medical equipment preparers.....	510	.0032	15.43
First line supervisors of landscaping, lawn service, and groundskeeping workers.....	370	.0024	14.96

Along with Detroit and Milwaukee, the share of employment for service occupations does not differ greatly from the nation. While the top paying service occupations in Pittsburgh (text table 8) earns almost twelve dollars more than the highest paid service occupation on a national scale, the share of employment is even greater. The study of the three traditional industrial areas have proved that the service industry has impacted a very large share of employment in these metropolitan areas, as formerly production based economies accounting for almost as much as, or more, service employment compared to the nation as a whole.

Service Occupations in the Los Angeles Metropolitan Area

Total covered employment for the Los Angeles area is reported at 3,860,400, and only 11 percent of which is service employment. Janitors and cleaners is the largest occupation, with 69,940 employees, or 0.46 percent of the total employment; security guards rank second with employment numbers of 49,080, or a 0.32 percent share of total employment. Three of the top ten occupations with the largest employment are classified as building and grounds maintenance, while another three are classified as food preparation and serving occupations (text table 9).

Text table 9. Top ten service occupations by employment for the Los Angeles metropolitan area, 1999

Occupation	Employment	Percent of service employment as a share of total employment	Hourly mean wage
Janitors and cleaners, except maids and housekeeping cleaners.....	69,940	.4614	\$ 9.06
Security guards.....	49,080	.3237	8.45
Nursing aides, orderlies, and attendants.....	27,880	.1839	8.49
Waiters and waitresses.....	25,490	.1681	6.79
Police and sheriff's patrol officers.....	23,310	.1538	22.73
Combined food preparation and serving workers, including fast food.....	20,100	.1326	7.17
Maids and housekeeping cleaners.....	19,720	.1301	7.80
Landscaping and groundskeeping workers.....	18,450	.1217	9.71
Food preparation workers.....	14,620	.0965	7.84
Home health aides.....	12,190	.0804	9.89

Text table 10 describes the service occupations for the area, with mean wages ranging from \$6.79 per hour for waiters and waitresses to first line supervisors of fire fighting and prevention workers at \$34.75 per hour. Eight of the ten highest paying occupations are classified as protective service occupations, and the wages are all at least two dollars more than the national average.

Text table 10. Top ten service occupations by wage for the Los Angeles metropolitan area, 1999

Occupation	Employment	Percent of service employment as a share of total employment	Hourly mean wage
First line supervisors of fire fighting and prevention workers.....	2,110	.0140	\$ 34.75
First line supervisors of police and detectives.....	4,060	.0268	34.74
Detectives and criminal investigators.....	2,220	.0147	27.75
Fire inspectors and investigators.....	*	.6596	27.29
Motion picture projectionists.....	110	.0007	25.97
Fire fighters.....	7,080	.0467	25.80
Police and sheriff's patrol officers.....	23,310	.1538	22.73

Correctional officers and jailers.....	1,950	.0128	21.01
First line supervisors of personal service workers.....	1,840	.0121	20.54
Physical therapist assistants.....	810	.0053	18.91

Los Angeles follows the pattern of the other cities, in that the top paying occupations classified as service are protective service occupations, although these occupations have a higher hourly mean wage than the other cities, and the nation. Eleven percent is the lowest share of service occupations of all the areas studied in this paper which may not comply with the common expectations of "white collar" cities.

Service Occupations in the New York City Metropolitan Area

The total employment for the entire area is 3,447,800, 15.4 percent of which are service occupations. This share of workers in service occupations is also lower than the national percentage. Employment ranges from 210 employed as theatrical makeup artists to 95,110 janitors and cleaners (text table 11). Janitors and cleaners represent 0.59 percent of all the employment in the New York City area, and home health aides represent 0.47 percent of all employment. The composition of the top ten largest employing occupations is varied, with three occupations classified as food preparation and serving and two occupations classified as building and grounds cleaning and maintenance.

Text table 11. Top ten service occupations by employment for the New York City metropolitan area, 1999

Occupation	Employment	Percent of service employment as a share of total employment	Hourly mean wage
Janitors and cleaners, except maids and housekeeping cleaners.....	95,110	.5854	\$ 12.37
Home health aides.....	75,980	.4676	8.26
Security guards.....	70,410	.4334	10.10
Personal and home care aides.....	42,730	.2630	8.38
Nursing aides, orderlies, and attendants.....	42,380	.2608	11.58
Maids and housekeeping cleaners.....	24,950	.1536	11.53
Food preparation workers.....	20,680	.1273	9.28
Waiters and waitresses.....	18,840	.1160	7.61
Counter attendants, cafeteria, food concession, and coffee shop.....	12,500	.0769	6.97
Child care workers.....	11,270	.0693	9.65

Text table 12 shows the mean wage of service occupations ranges from \$6.59 per hour for fast food cooks, to \$24.47 per hour for first line supervisors of landscaping, lawn service, and grounds keeping workers. In contrast to the other cities included in this study, only four of the ten highest paying occupations are classified as protective service. Building and grounds cleaning and maintenance; healthcare support; and personal services comprise the rest.

Text table 12. Top ten service occupations by wage for the New York City metropolitan area, 1999

Occupation	Employment	Percent of service employment as a share of total employment	Hourly mean wage
First line supervisors of landscaping, lawn service, and groundskeeping workers.	2,270	.0140	\$ 24.47
Detectives and criminal investigators.....	4,210	.0259	22.01
Motion picture projectionists.....	80	.0005	21.00
Physical therapist assistants.....	760	.0047	20.53
Fitness trainers and aerobics instructors.....	3,310	.0204	19.98

Fire inspectors and investigators.....	480	.0030	19.31
Bailiffs.....	*	.6155	18.88
First line supervisors of food preparation and serving workers.....	5,950	.0366	17.79
Private detectives and investigators.....	400	.0024	17.26
First line supervisors of housekeeping and janitorial workers.....	5,290	.0326	17.15

Service Occupations in the Washington, DC Metropolitan Area

Total covered employment for the Washington, DC metropolitan area is reported at 2,441,750, and 16.7 percent is attributed to service occupations. Employment ranges from 60 for motion picture projectionists to 51,980 for janitors and cleaners (text table 13). Janitors and cleaners account for 0.43 percent of total employment in Washington, DC. Combined food preparations and serving workers ranks second, accounting for 0.31 percent of total employment. Four of the top ten occupations with the largest employment are classified as building and grounds cleaning and maintenance occupations.

Text table 13. Top ten service occupations by employment for the Washington, DC metropolitan area, 1999

Occupation	Employment	Percent of service employment as a share of total employment	Hourly mean wage
Janitors and cleaners, except maids and housekeeping cleaners.....	51,980	.4281	\$ 8.23
Combined food preparation and serving workers, including fast food.....	37,540	.3092	6.92
Security guards.....	34,430	.2835	10.14
Waiters and waitresses.....	29,580	.2436	6.69
Maids and housekeeping cleaners.....	20,620	.1698	8.55
Nursing aides, orderlies, and attendants.....	16,400	.1351	9.31
Landscaping and groundskeeping workers.....	14,410	.1187	9.61
Police and sheriff's patrol officers.....	13,470	.1109	19.75
First line supervisors of housekeeping and janitorial workers.....	11,480	.0946	10.50
Cooks, restaurant.....	9,840	.0811	9.85

The highest paying service occupation is first line supervisors of police and detectives, at \$32.24 per hour. The lowest mean wage is \$6.69 per hour for waiters and waitresses (text table 14). Of the ten highest paying occupations, six are classified as protective service.

Text table 14. Top ten service occupations by wage for the Washington, DC metropolitan area, 1999

Occupation	Total service employment by area	Percent of service employment as a share of total employment	Hourly mean wage
First line supervisors of police and detectives.....	2,370	.0195	\$ 32.24
Detectives and criminal investigators.....	3,690	.0304	28.34
First line supervisors of fire fighting and prevention workers.....	1,050	.0086	27.30
Fish and game wardens.....	*	.0003	19.88
Police and sheriff's patrol officers.....	13,470	.1109	19.75
Chefs and head cooks.....	1,800	.0148	18.49
Fire fighters.....	4,730	.0389	17.33
Physical therapist assistants.....	690	.0057	16.89
First line supervisors of personal service workers.....	2,230	.0184	16.74
Fitness trainers and aerobics instructors.....	2,820	.0232	15.67

Conclusions

Careful review of the top ten service occupations by wage and employment for all six of the selected areas, allows one to conclude that the largest service occupations and the highest paid occupations are fairly similar in these different metropolitan areas of the country. Janitors and cleaners is the largest employing occupation for four of the selected areas, as well as

the nation. It is the second largest employing occupation for the other two areas. Waiters and waitresses are also prominently featured in the top employing service occupations.

A review of the top paying service occupations also shows similarity across the country. First line supervisors of police and detectives is the number one paying occupation for the nation, as well as three of the selected areas. The occupation is in the top ten for two other areas. Several other protective service occupations are included in the highest paying occupations for most of the areas, as well.

The aim of this article, as stated in the beginning, was to compare service occupations in metropolitan areas that are traditionally thought of as industrial and "white collar". The most telling statistic included in this paper is the percent of service employment represented in each area. Nationally, service occupations account for 16.9 percent of total employment. The only selected area that is higher than the national percentage is Pittsburgh. Service occupations represent 17.9 percent of total employment in the metropolitan area. Of the other industrial areas, Milwaukee ranks third among the areas discussed in this paper at 15.9 percent, and Detroit ranks fifth at 14.0 percent. Of the traditional white-collar areas, Los Angeles ranks sixth, with only 11 percent of its total employment coming from service occupations.

From these figures, we see that the presence of service occupations in relation to the total of all occupations in the traditional industrial areas studied is just as strong, if not

stronger, than the presence of service occupations in other selected cities.

Wage Dispersion Among Select Industries

John Jones

Earlier articles in this publication discussed how industry plays a role in occupational wage dispersion. This article will explore wage dispersion for select industries. For the purpose of this paper, industries will be defined as the 2-digit major groups established by the 1987 Standard Industrial Classification Manual (SIC). An example of wage dispersion can be defined as the distribution of wages for an occupation, and how the distribution may vary by industry. Wage dispersion is defined as the difference between the 90th and 10th percentile wages divided by the median for a given occupation. The result of this calculation is called the dispersion ratio.

Method and Definitions

Using Occupational Employment Statistics (OES) data, counts of employment are taken for occupations that are found in the same 39 (SIC) 2-digit industries. The number of (SIC) 2-digit industries are limited to 39 because of the absence of occupational titles that cross every industry. Of all 770 occupations, only seven occupations qualify for wage dispersion comparison across all (SIC) 2-digit industries.

Only occupations that pass BLS confidentiality standards and have quantifiable percentiles in the 10th and 90th ranges, the dispersion ratio can not be calculated and therefore is excluded. Fifty occupations across 39 industries qualify under the stated

conditions. Of these fifty, eight are eliminated because they are residual occupational titles.

To generate a dispersion number, the annual 10th percentile is subtracted from the annual 90th percentile. The result is divided by the median annual wage. This generates a ratio that measures dispersion of wages. If the ratio is less than one, then the difference between the 90th and 10th percentile wages is less than the median wage. If the ratio equals one, then the difference between the 90th and 10th percentiles equals the median. Finally, if the ratio is greater than one then the difference between the 90th and 10th percentiles is greater than the median, which denotes greater dispersion in that occupation relative to the others.

Following the generation of the ratio, each of the occupations along with their industrial designation are sorted and ranked by the dispersion ratio. To measure the industry effect as a whole on the occupations, ranks are assigned to each occupation based on their position determined by the dispersion ratio, smallest to largest. All of the ranks are summed for each industry. For example, Federal, State and local government has individual occupational ranks of 1, 3, 7, 8, 13, 60, 96, 125, 130, 144, 248, 250, 278, 317, 327, 354, 358, 375, 509, 523, 532, 553, 571, 591, 623, 625, 677, 707, 711, 721, 739, 756, 782, 799, 816, 820, 852, 972, 980, 1012, 1054, and 1235. These 42 occupational ranks sum to 21,254, the lowest sum of any of the 39 industries. Results for the rest of the industries are listed in text table 1.

Results

Text table 2 lists the top and bottom ranked dispersion ratios for each individual occupation. Looking at each individual occupation, receptionists and information clerks; billing and posting clerks and machine operators; data entry keyers; and payroll and timekeeping clerks are just some of the occupations that have low dispersion. On the other hand, first-line supervisors/managers of non-retail sales workers; sales representatives, wholesale and manufacturing, except technical and scientific products; administrative services managers; and purchasing managers are a few of the occupations that have high dispersion. Finally, security guards is just one example of an occupation that falls between the others and has medium dispersion.

Text table 3 lists the top 20 and the bottom 20 occupational titles with industries by dispersion ratio. Production, planning, and expediting clerks in Federal, State and local government is ranked first with the lowest dispersion ratio of 0.40. On the other hand, the occupation with the most dispersion is first-line supervisors/managers of non-retail sales workers in oil and gas extraction with a ratio of 2.61.

The rank of industries with respect to all 42 occupations is listed in text table 1. The industry with the lowest dispersion overall is Federal, State and local government. Some industries with high dispersion overall are water transportation, engineering and management services, automotive dealers and service stations, membership organization, and apparel and other textile products.

In conclusion, there is significant evidence that an occupation's industry has strong effects on wage dispersion. This point is made most strongly by text table 1. For example, it shows that the sum of all occupational ranks for apparel and other textile products is more than double the State and local government sum, denoting high dispersion for the same occupations.

Text table 1 - Industry dispersion rank

For all occupations

Rank	Sum of ranks	SIC Title
1	21,254	State and local government
2	24,650	Textile mill products
3	26,580	Rubber and misc. plastics products
4	26,861	Primary metal industries
5	27,010	Health services
6	28,336	Social services
7	28,416	Furniture and fixtures
8	29,151	Fabricated metal products
9	29,726	General merchandise stores
10	29,814	Instruments and related products
11	30,216	Industrial machinery and equipment
12	30,265	Electronic & other elec. equipment
13	30,282	Communication
14	30,931	Stone, clay, and glass products
15	31,872	Food and kindred products
16	33,402	Educational services
17	33,905	Chemicals and allied products
18	34,402	Building materials & garden supplies
19	35,636	General building contractors
20	35,764	Business services
21	35,908	Electric, gas, and sanitary services
22	37,121	Apparel and accessory stores
23	37,311	Trucking and warehousing
24	37,371	Heavy construction, ex. building
25	37,831	Wholesale trade--durable goods
26	37,950	Food stores
27	37,976	Printing and publishing
28	38,365	Special trade contractors
29	38,992	Miscellaneous retail
30	39,032	Transportation services
31	39,243	Amusement & recreation services
32	39,498	Wholesale trade--nondurable goods
33	39,563	Oil and gas extraction
34	39,744	Furniture and home furnishings stores
35	40,528	Water transportation
36	40,886	Engineering & management services
37	41,307	Automotive dealers & service station
38	42,195	Membership organizations
39	43,047	Apparel and other textile products

Text table 2 - First and last dispersion ratio for each occupaiton

Industry Title	10th pct	Median	90th pct	Ratio	Occupational Title
Building materials & garden supplies	\$ 12,970	\$ 17,210	\$ 22,910	0.58	Receptionists and information clerks
State and local government	\$ 13,610	\$ 20,750	\$ 32,840	0.93	Receptionists and information clerks
Oil and gas extraction	\$ 19,350	\$ 25,560	\$ 32,810	0.53	Switchboard operators, including answering service
Trucking and warehousing	\$ 15,290	\$ 22,080	\$ 39,560	1.10	Switchboard operators, including answering service
Textile mill products	\$ 16,140	\$ 21,270	\$ 27,540	0.54	Data entry keyers
Electric, gas, and sanitary services	\$ 16,420	\$ 25,080	\$ 41,600	1.00	Data entry keyers
Textile mill products	\$ 18,650	\$ 23,980	\$ 32,130	0.56	Human resources assistants, except payroll and timekeeping
Amusement & recreation services	\$ 12,650	\$ 15,230	\$ 30,660	1.18	Human resources assistants, except payroll and timekeeping
Communication	\$ 22,990	\$ 35,080	\$ 42,710	0.56	Payroll and timekeeping clerks
Furniture and home furnishings stores	\$ 13,500	\$ 23,950	\$ 37,400	1.00	Payroll and timekeeping clerks
Instruments and related products	\$ 18,800	\$ 26,210	\$ 34,570	0.60	Billing and posting clerks and machine operators
State and local government	\$ 16,590	\$ 25,210	\$ 39,610	0.91	Billing and posting clerks and machine operators
Food stores	\$ 15,600	\$ 22,410	\$ 27,830	0.55	File clerks
Water transportation	\$ 14,380	\$ 21,650	\$ 44,940	1.41	File clerks
Instruments and related products	\$ 24,600	\$ 34,850	\$ 44,640	0.58	Executive secretaries and administrative assistants
Apparel and other textile products	\$ 17,330	\$ 28,970	\$ 46,600	1.01	Executive secretaries and administrative assistants
Membership organizations	\$ 17,530	\$ 20,720	\$ 29,920	0.60	Order clerks
Automotive dealers & service station	\$ 14,030	\$ 21,790	\$ 45,190	1.43	Order clerks
State and local government	\$ 24,640	\$ 32,160	\$ 41,870	0.54	Shipping, receiving, and traffic clerks
Water transportation	\$ 17,750	\$ 29,030	\$ 65,560	1.65	Shipping, receiving, and traffic clerks
Textile mill products	\$ 12,770	\$ 16,410	\$ 21,830	0.55	Janitors and cleaners, except maids and housekeeping cleaners
Oil and gas extraction	\$ 11,860	\$ 16,980	\$ 34,000	1.30	Janitors and cleaners, except maids and housekeeping cleaners
Primary metal industries	\$ 17,230	\$ 24,020	\$ 32,820	0.65	Secretaries, except legal, medical, and executive
Transportation services	\$ 12,630	\$ 20,450	\$ 33,740	1.03	Secretaries, except legal, medical, and executive
State and local government	\$ 26,830	\$ 38,080	\$ 43,450	0.44	Stock clerks and order fillers
Water transportation	\$ 15,100	\$ 23,640	\$ 46,140	1.31	Stock clerks and order fillers
Building materials & garden supplies	\$ 14,210	\$ 17,700	\$ 24,250	0.57	Customer service representatives
Oil and gas extraction	\$ 18,680	\$ 24,660	\$ 53,670	1.42	Customer service representatives
Textile mill products	\$ 18,950	\$ 26,100	\$ 34,870	0.61	Computer operators
Transportation services	\$ 16,940	\$ 29,000	\$ 50,330	1.15	Computer operators
Instruments and related products	\$ 19,870	\$ 28,230	\$ 39,630	0.70	Bookkeeping, accounting, and auditing clerks
Membership organizations	\$ 12,530	\$ 22,770	\$ 36,670	1.06	Bookkeeping, accounting, and auditing clerks
Textile mill products	\$ 15,070	\$ 20,660	\$ 27,540	0.60	Office clerks, general
Oil and gas extraction	\$ 14,200	\$ 23,780	\$ 42,400	1.19	Office clerks, general

Text table 2-Continued

Health services	\$ 23,220	\$ 27,710	\$ 34,710	0.41	Truck drivers, heavy and tractor-trailer
General merchandise stores	\$ 19,670	\$ 30,740	\$ 67,930	1.57	Truck drivers, heavy and tractor-trailer
Water transportation	\$ 18,730	\$ 27,480	\$ 34,250	0.56	Truck drivers, light or delivery services
Membership organizations	\$ 13,320	\$ 23,790	\$ 48,960	1.50	Truck drivers, light or delivery services
Textile mill products	\$ 14,070	\$ 17,480	\$ 24,940	0.62	Laborers and freight, stock, and material movers, hand
Engineering & management services	\$ 13,100	\$ 19,560	\$ 42,380	1.50	Laborers and freight, stock, and material movers, hand
Electric, gas, and sanitary services	\$ 40,480	\$ 58,670	\$ 74,970	0.59	First-line supervisors/managers of mechanics, installers, and repairers
Apparel and accessory stores	\$ 18,050	\$ 45,190	\$ 105,690	1.94	First-line supervisors/managers of mechanics, installers, and repairers
Food and kindred products	\$ 32,140	\$ 44,410	\$ 63,270	0.70	Network and computer systems administrators
Automotive dealers & service station	\$ 18,870	\$ 41,070	\$ 80,180	1.49	Network and computer systems administrators
Textile mill products	\$ 22,670	\$ 30,740	\$ 43,180	0.67	Computer support specialists
Food and kindred products	\$ 22,990	\$ 39,220	\$ 69,040	1.17	Computer support specialists
Textile mill products	\$ 18,730	\$ 25,780	\$ 34,980	0.63	Maintenance and repair workers, general
Water transportation	\$ 13,640	\$ 23,200	\$ 46,220	1.40	Maintenance and repair workers, general
State and local government	\$ 29,070	\$ 38,950	\$ 44,670	0.40	Production, planning, and expediting clerks
Membership organizations	\$ 15,200	\$ 21,480	\$ 43,170	1.30	Production, planning, and expediting clerks
Heavy construction, ex. building	\$ 29,060	\$ 34,250	\$ 49,110	0.59	Employment, recruitment, and placement specialists
Printing and publishing	\$ 26,460	\$ 43,870	\$ 105,250	1.80	Employment, recruitment, and placement specialists
Transportation services	\$ 14,650	\$ 17,090	\$ 23,830	0.54	Security guards
Special trade contractors	\$ 11,600	\$ 12,530	\$ 31,440	1.58	Security guards
Electric, gas, and sanitary services	\$ 35,290	\$ 56,920	\$ 71,070	0.63	Training and development specialists
Food and kindred products	\$ 18,500	\$ 27,260	\$ 62,330	1.61	Training and development specialists
General building contractors	\$ 49,860	\$ 65,840	\$ 84,310	0.52	Computer and information systems managers
Building materials & garden supplies	\$ 23,340	\$ 61,720	\$ 124,600	1.64	Computer and information systems managers
State and local government	\$ 27,870	\$ 43,160	\$ 60,120	0.75	First-line supervisors/managers of production and operating workers
Apparel and other textile products	\$ 17,840	\$ 28,240	\$ 62,080	1.57	First-line supervisors/managers of production and operating workers
Furniture and fixtures	\$ 23,370	\$ 36,150	\$ 53,090	0.82	Purchasing agents, except wholesale, retail, and farm products
Apparel and accessory stores	\$ 24,590	\$ 37,210	\$ 81,180	1.52	Purchasing agents, except wholesale, retail, and farm products
Health services	\$ 21,530	\$ 31,450	\$ 47,630	0.83	First-line supervisors/managers of office and administrative support workers
Automotive dealers & service station	\$ 18,440	\$ 32,680	\$ 64,380	1.41	First-line supervisors/managers of office and administrative support workers
State and local government	\$ 45,720	\$ 58,120	\$ 76,510	0.53	Marketing managers
General merchandise stores	\$ 31,100	\$ 46,960	\$ 117,640	1.84	Marketing managers

Text table 2-Continued

State and local government	\$ 29,360	\$ 45,500	\$ 66,800	0.82	Computer programmers
Amusement & recreation services	\$ 23,460	\$ 44,800	\$ 85,790	1.39	Computer programmers
Health services	\$ 24,760	\$ 36,590	\$ 55,220	0.83	Accountants and auditors
Engineering & management services	\$ 25,780	\$ 41,160	\$ 89,600	1.55	Accountants and auditors
State and local government	\$ 36,410	\$ 62,190	\$ 89,910	0.86	Financial managers
Wholesale trade--durable goods	\$ 35,520	\$ 61,070	\$ 125,820	1.48	Financial managers
State and local government	\$ 36,030	\$ 64,480	\$ 90,450	0.84	Purchasing managers
Food stores	\$ 16,300	\$ 29,630	\$ 72,650	1.90	Purchasing managers
Primary metal industries	\$ 25,840	\$ 49,920	\$ 56,120	0.61	First-line supervisors/managers of retail sales workers
Automotive dealers & service station	\$ 17,130	\$ 30,140	\$ 80,820	2.11	First-line supervisors/managers of retail sales workers
State and local government	\$ 36,980	\$ 61,010	\$ 88,490	0.84	Human resources managers
General merchandise stores	\$ 21,250	\$ 34,960	\$ 79,950	1.68	Human resources managers
Food stores	\$ 17,070	\$ 25,070	\$ 35,630	0.74	First-line supervisors/managers of non-retail sales workers
Oil and gas extraction	\$ 21,840	\$ 44,180	\$ 137,050	2.61	First-line supervisors/managers of non-retail sales workers
Electric, gas, and sanitary services	\$ 29,160	\$ 66,310	\$ 98,370	1.04	Administrative services managers
Apparel and other textile products	\$ 22,400	\$ 41,920	\$ 100,080	1.85	Administrative services managers
State and local government	\$ 20,110	\$ 32,660	\$ 44,070	0.73	Sales representatives, wholesale and manufacturing, except technical and scientific products
Apparel and other textile products	\$ 17,510	\$ 38,330	\$ 107,450	2.35	Sales representatives, wholesale and manufacturing, except technical and scientific products

Text table 3 - Occupations and industries with the highest and lowest dispersion ratios

SIC Title	Rank	Ratio	Occupational Title	10th pct	Median	90th pct
State and local government	1	0.40	Production, planning, and expediting clerks	\$ 29,070	\$ 38,950	\$ 44,670
Health services (except sic 806)	2	0.41	Truck drivers, heavy and tractor-trailer	\$ 23,220	\$ 27,710	\$ 34,710
State and local government	3	0.44	Stock clerks and order fillers	\$ 26,830	\$ 38,080	\$ 43,450
General building contractors	4	0.52	Computer and information systems managers	\$ 49,860	\$ 65,840	\$ 84,310
Oil and gas extraction	5	0.53	Switchboard operators, including answering service	\$ 19,350	\$ 25,560	\$ 32,810
Furniture and home furnishings stores	6	0.53	Switchboard operators, including answering service	\$ 13,160	\$ 17,160	\$ 22,220
State and local government	7	0.53	Marketing managers	\$ 45,720	\$ 58,120	\$ 76,510
State and local government	8	0.54	Shipping, receiving, and traffic clerks	\$ 24,640	\$ 32,160	\$ 41,870
Textile mill products	9	0.54	Data entry keyers	\$ 16,140	\$ 21,270	\$ 27,540
Transportation services	10	0.54	Security guards	\$ 14,650	\$ 17,090	\$ 23,830
Furniture and fixtures	11	0.54	Switchboard operators, including answering service	\$ 15,200	\$ 20,010	\$ 25,960
Food stores	12	0.55	File clerks	\$ 15,600	\$ 22,410	\$ 27,830
State and local government	13	0.55	Data entry keyers	\$ 18,790	\$ 25,160	\$ 32,650
Textile mill products	14	0.55	Janitors and cleaners, except maids and housekeeping cleaners	\$ 12,770	\$ 16,410	\$ 21,830
Textile mill products	15	0.56	Human resources assistants, except payroll and timekeeping	\$ 18,650	\$ 23,980	\$ 32,130
Communication	16	0.56	Payroll and timekeeping clerks	\$ 22,990	\$ 35,080	\$ 42,710
Instruments and related products	17	0.56	Switchboard operators, including answering service	\$ 15,700	\$ 21,840	\$ 28,010
Rubber and misc. plastics products	18	0.56	Switchboard operators, including answering service	\$ 15,750	\$ 21,070	\$ 27,640
Water transportation	19	0.56	Truck drivers, light or delivery services	\$ 18,730	\$ 27,480	\$ 34,250
Oil and gas extraction	20	0.57	Marketing managers	\$ 75,760	\$ 99,340	\$ 132,000
Business services	1619	1.76	Sales representatives, wholesale and manufacturing, except technical and scientific products	\$ 18,280	\$ 35,440	\$ 80,570
Miscellaneous retail	1620	1.78	Purchasing managers	\$ 16,690	\$ 30,360	\$ 70,580
Apparel and accessory stores	1621	1.79	Sales representatives, wholesale and manufacturing, except technical and scientific products	\$ 12,260	\$ 18,530	\$ 45,410
Printing and publishing	1622	1.80	Employment, recruitment, and placement specialists	\$ 26,460	\$ 43,870	\$ 105,250
General building contractors	1623	1.80	First-line supervisors/managers of non-retail sales workers	\$ 24,070	\$ 47,620	\$ 109,970
Heavy construction, ex. building	1624	1.82	First-line supervisors/managers of non-retail sales workers	\$ 33,070	\$ 44,470	\$ 113,860
Miscellaneous retail	1625	1.82	Sales representatives, wholesale and manufacturing, except technical and scientific products	\$ 14,400	\$ 28,520	\$ 66,310
General merchandise stores	1626	1.84	Marketing managers	\$ 31,100	\$ 46,960	\$ 117,640
Furniture and home furnishings stores	1627	1.84	Sales representatives, wholesale and manufacturing, except technical and scientific products	\$ 15,320	\$ 31,560	\$ 73,490
Apparel and other textile products	1628	1.85	Administrative services managers	\$ 22,400	\$ 41,920	\$ 100,080
Printing and publishing	1629	1.90	Sales representatives, wholesale and manufacturing, except technical and scientific products	\$ 20,220	\$ 39,400	\$ 95,040
Food stores	1630	1.90	Purchasing managers	\$ 16,300	\$ 29,630	\$ 72,650
General building contractors	1631	1.91	Sales representatives, wholesale and manufacturing, except technical and scientific products	\$ 16,330	\$ 35,860	\$ 84,700
Apparel and accessory stores	1632	1.94	First-line supervisors/managers of mechanics, installers, and repairers	\$ 18,050	\$ 45,190	\$ 105,690
Apparel and other textile products	1633	2.11	First-line supervisors/managers of non-retail sales workers	\$ 23,910	\$ 36,860	\$ 101,600
Automotive dealers & service station	1634	2.11	First-line supervisors/managers of retail sales workers	\$ 17,130	\$ 30,140	\$ 80,820
Wholesale trade--nondurable goods	1635	2.21	First-line supervisors/managers of non-retail sales workers	\$ 27,170	\$ 49,130	\$ 135,900
Building materials & garden supplies	1636	2.27	First-line supervisors/managers of non-retail sales workers	\$ 16,840	\$ 24,030	\$ 71,280
Apparel and other textile products	1637	2.35	Sales representatives, wholesale and manufacturing, except technical and scientific products	\$ 17,510	\$ 38,330	\$ 107,450
Oil and gas extraction	1638	2.61	First-line supervisors/managers of non-retail sales workers	\$ 21,840	\$ 44,180	\$ 137,050

An Analysis of the Possible Correlation between Occupational Mean Wage Levels and the Total Employment of a Metropolitan Statistical Area

Michael Soloy

The Occupational Employment Statistics (OES) program collected occupational wage data for approximately 800 occupations in 337 Metropolitan Statistical Areas (MSA) in 1999. This article uses 1999 OES occupational MSA wage data to examine whether there is a correlation between the number of workers employed within an MSA and the overall occupational wages. Unlike other data sources, which can only provide an all-occupation MSA wage, the OES program provides data that allows for the comparison of specific occupations, ensuring that only wages for workers that perform the same duties are compared to each other. For example, a high population city may have a higher all-occupation wage than a smaller city because they have a higher percentage of high wage occupations, such as doctors or engineers, instead of having overall higher individual mean wages for the same group of detailed occupations. This article examines whether or not MSAs with a higher amount of employment have higher occupational wages overall for the same occupations than MSAs with a lower level of employment.

Methodology

Each of the 337 MSAs are assigned to one of five size groups according to their total MSA employment. The groups are shown in text table 1 below:

Text table 1: MSA size groups

Group Designation letter	Total OES MSA employment requirements for size group	Number of MSAs that qualify(out of 337 total)
A	Equal to or greater than 2,000,000 workers	9
B	Equal to or greater than 1,000,000 workers, but less than 2,000,000	16
C	Equal to or greater than 500,000 workers, but less than 1,000,000	35
D	Equal to or greater than 100,000 workers, but less than 500,000	128
E	Less than 100,000 workers	149

The OES program does not include in its employment self-employed workers, owners of non-incorporated businesses, military, or workers in farm establishments. Refer to Appendix B at the end of this publication for a full description of the OES survey methodology. In addition, the total OES MSA employment represents the number of workers that work in that MSA; it does not represent the population of the MSA.

The following procedure is used to analyze the data: 1.) Five MSAs are selected at random from each of the five MSA size groups for a total selection of 25 MSAs; 2.) All occupations that are found in all 25 of the MSAs are selected: approximately 80 occupations fit this criteria for each 25 MSA sample; 3.) The selected area/occupation cells are sorted first by occupation and then by the annual mean wage; 4.) The area wage for each occupation is ranked from 1 (representing the highest area wage) to 25 (representing the lowest area wage). This ranking is repeated for each of the selected occupations; 5.) The area/occupation ranks are averaged for each of the five MSA size groups. This procedure is repeated five times for five separate 25 MSA samples.

Results

The results for each of the five samples are shown in the following five text tables.

Text table 2: Sample 1 results

MSA size group	Average rank
B	9.51
A	10.14
C	12.16
D	15.12
E	18.07

Text table 3: Sample 2 results

MSA size group	Average rank
A	8.00
B	8.53
C	14.45
D	16.59
E	17.43

Text table 4: Sample 3 results

MSA size group	Average rank
A	9.80
B	9.92
D	12.99
C	14.57
E	17.71

Text table 5: Sample 4 results

MSA size group	Average rank
A	7.89
B	9.11
D	12.94
C	13.67
E	18.97

Text table 6: Sample 5 results

MSA size group	Average rank
A	7.38
B	8.83
C	11.21
D	17.93
E	19.66

As described earlier, a lower numerical rank value for a given MSA/occupation cell corresponds to a higher MSA occupational mean wage compared to other selected areas for that same occupation. Therefore, a lower average numerical rank value for a MSA size group represents higher overall occupational wages for the given MSA size group compared to the other MSA size groups.

Conclusions

The expected result is for the MSA size groups to be in order from A to E when sorted by lowest average rank to highest average. This would correspond to the idea that MSAs with higher total employment have higher occupational wages overall than the MSAs with lower total employment.

Two of the five samples, sample 2 and sample 5, show the expected results. The other three samples show results that are close to the expected results, but each have two MSA size groups that are in a different order than expected. However, the two largest MSA size groups, A and B, always have the lowest two average ranks in all five samples examined. Also, the smallest MSA size group, E, always has the highest average rank for all five samples examined. Even though the five samples do not provide an exact match with the expected results, they provide support for

the hypothesis that MSAs with large total employment have higher occupational wages overall for the same occupations than MSAs with smaller total employment.

Implementing the Standard Occupational Classification in the OES Survey

Kristine Heffel and Laurie Salmon

The Occupational Employment Statistics (OES) program at the Bureau of Labor Statistics began in 1971, with 50,000 questionnaires being sent to manufacturing establishments across the country. In 1973, non-manufacturing firms were added to the survey. The original occupational classification system included mainly manufacturing workers because the survey was originally designed to collect data in manufacturing industries. Additional occupational groups were added as more industries were added to the survey. In 1980 the Standard Occupational Classification (SOC) system was developed, and the OES program's occupational structure was modified to reflect the SOC when possible.

While changes in the structure of the US workforce over time made the SOC outdated, the OES program used its data on workforce composition to update its own occupational structure to reflect these changes. The OES program used its own occupational structure through the 1998 survey. Because other sources of occupational information had different occupational structures that best suited the needs of their data users, the occupational

data from different sources in the federal government was not comparable.

In order to create comparable occupational data between government agencies, the Office of Management and Budget established the SOC Revision Policy Committee (SOCRPC) to create a classification system that would reflect the current structure of the US workforce and be flexible enough to be used by all government agencies collecting occupational data. Universal use of a single classification system would allow different types of data on the same workers to be compared. The SOCRPC conducted a study on how they should proceed, and decided to use the OES classification system as the starting point for the revised SOC because the regular updating of the OES classification system made it one of the most comprehensive and modern systems in existence.

In creating the new SOC, the OES classification system was modified to incorporate the needs of other statistical agencies and to better reflect the changing economy and current occupational structure of the nation. The new SOC reflects the shift toward a more service-oriented economy, advances in automation and technology, and increasing concern about the environment. In comparison with the OES system, more detail has been added in the areas of computer, engineering, health, and

science occupations. In addition, many of the previous production occupations from the OES system have been consolidated, combining machine setters, operators, and tenders of a single machine into a single occupation in the SOC structure.

The SOC classification is based on occupations rather than individual jobs, where an occupation can be considered an aggregation of jobs requiring similar skills and tasks. Occupations in the SOC focus on the work performed and required skills, education, and training. A definition is provided for each occupation listing tasks performed by all workers in the occupation, and occasionally duties that some workers may perform. The SOC is grouped by occupations in a hierarchical structure. There are 23 major groups, 98 minor groups, about 450 broad occupations, and approximately 800 detailed occupations, which permit the use of different levels of occupational detail through use of different levels in the SOC structure.

The SOC is intended to provide a standard system of occupational coding across government agencies collecting occupational information. This will allow data users to compare occupational data from different agencies and different types of surveys more easily. Federal agencies using the SOC coding system include the Bureau of Labor Statistics (BLS), the Bureau of the

Census, the Employment and Training Administration (ETA), the National Science Foundation, the National Center for Education Statistics, and the Defense Manpower Data Center.

The Occupational Employment Statistics program is one of the BLS programs that uses the SOC for collecting occupational data, beginning with the 1999 survey. The occupational wage and employment estimates from the OES program use a three-year survey cycle to collect the full sample of 1.2 million establishments, with one-third of the sample collected each year. In 1998, the data from 1996, 1997, and 1998 were combined to form the first set of OES estimates using the full sample. The introduction of the new SOC coding system for the 1999 data provided a technical challenge to combine the three years of data. This rest of this article describes changes from the old OES occupational classification to the new SOC classification system and then explains some of the procedures used by the OES program in the transition to the SOC.

SOC-based Survey Forms

The Occupational Employment Statistics (OES) program began using the SOC codes, titles, and definitions on its 1999 survey forms, with the resulting employment and wage estimates included

in this publication. The majority, but not all of the detailed SOC occupations are collected on the OES survey forms. However, in eight cases the OES program used the SOC broad occupation instead of the detailed occupations. For example, the OES survey forms contain the broad occupation "dentists" rather than the five more specific dental specialty occupations. The specific combination of detailed and broad SOC occupations used by the OES program is referred to as the OES 99 structure.

The SOC-based survey forms contain both the occupational titles and definitions; however, in many cases, these definitions have been shortened to include only the key duties of the occupation due to space limitations on the survey forms. In addition, many occupations have an alternate title listed at the beginning of the definition to assist in coding specific job titles. No form contains all 800 SOC occupations; instead, each survey form contains occupations specific to the industries being surveyed on that form. This reduces the burden to employers by limiting the number of occupations that appear on each survey form. If an occupation is not specifically listed on a survey form, the respondent can write in additional occupations on a supplemental page.

The occupations for each form were chosen based on employment for related occupations appearing on the old OES forms. Supplemental data from the Office of Employment Projections matrix was used to decide which additional occupations should be surveyed for a particular industry. Based on these sources, the most common occupations for an industry or group of industries appear on that form. Some occupations are common to all industries and appear on nearly every survey form, including general and operations managers; accountants and auditors; executive secretaries and administrative assistants; bookkeeping, accounting, and auditing clerks; and janitors and cleaners, except maids and housekeeping cleaners.

There are three types of forms used for the OES survey: long forms, short forms, and unstructured forms. The long forms are sent to larger establishments, generally those with more than 50 employees. Most long forms contain between 100 and 200 occupations, with an average of 162 occupations per form. In addition to the detailed occupations, the long forms contain residual categories for those workers that are not specifically listed on the form. At the end of the form is a supplemental page where employers are requested to provide more detailed occupational information for those workers that have been categorized in the residual categories. Establishments with 10 to 49 employees usually receive a shorter version of the form. The

number of occupations on the short forms ranges from 13 to 95, with an average of 54 occupations per form. There are no residual categories on the short forms. Instead there is a supplemental page at the end of the form that allows employers to write in additional detailed occupations that were not included on the form. These supplemental sheets provide information about occupations that may be new and emerging in the labor market, or occupations that may be appearing in new industries. The unstructured forms are generally sent to establishments with fewer than 10 employees and do not list any detailed occupations. Instead, the employer provides the title and job description for each employee found within the establishment, similar to the supplemental sheets on the other forms. Classification specialists then code each worker to an SOC occupation based on the job duties.

SOC training and support materials

To assist the States in learning the new SOC coding system, the OES program developed a computer based training (CBT) system. This system presents principles and rules of occupational coding in the SOC in an individualized interactive format, allowing the user to work at his or her own pace and review sections as necessary. Sections in the CBT system include background information, SOC structure, SOC definitions, coding guidelines, SOC highlights, and coding exercises. The SOC-CBT is primarily

designed to introduce new users to the SOC system and the rules of occupational coding, but can also serve as a coding review for the more experienced SOC user. An SOC coding course has also been offered to provide the State office staff with additional information about the SOC system and coding principles.

Data validation

The OES program uses a series of computer programs to validate the employment and wage data. Many of these validation programs were modified to accommodate the new SOC codes. The validation system includes programs that perform the following functions:

- List occupation/area wages that are significantly different from the previous year
- List occupational pairs where a typically low paying occupation earns more than a typically high paying occupation (such as nurses' aides reported as earning more than nurses).
- List occupations in unusual wage intervals (such as lawyers reported in the lowest wage intervals).

- List occupations in unusual or invalid industries (such as postal service mail carriers reported in industries other than the postal service).
- List dependent occupations without an independent occupation (such as supervisors with no subordinate workers, or carpenter helpers in an establishment that reports no carpenters)
- List schedules where all employment appears in one occupation or one wage range

Related programs also identify the specific establishments reporting the occupations identified by the programs above. By comparing the items identified as potential problems with the list of establishments reporting these occupations, respondents can be identified and contacted for verification, clarification, or correction of the data provided. These routines are designed to screen data for potential coding or keypunch errors as well as respondent errors, and to assist in data review at both the national, regional and State office levels.

Conversion of 1997 and 1998 OES data

Because the OES sample design requires combining data collected over a three-year period, data from 1997 and 1998 had to be converted to the SOC format to be combined with 1999 SOC based data. In order to convert OES codes to SOC codes, a list of comparable occupations was created between occupations in the current OES structure and the new SOC structure. About half of the 769 occupations permit combining OES-coded data from 1997 and 1998 with the SOC-coded data from 1999. These matches include occupations that crosswalk from one OES occupation to one SOC occupation and cases where several OES occupations aggregate cleanly into a single SOC occupation. The one-to-one matches have similar titles and definitions between the OES and SOC occupations. For example, the OES occupation credit analysts (21105) has the same title and definition as the SOC occupation credit analysts (13-2041). Other examples of one-to-one matches include tax preparers; clergy; interior designers; and ship engineers. An example of a single SOC occupation that is made by complete aggregation of multiple OES occupations is welders, cutters, solderers, and brazers (51-4121), which is made up of the two OES occupations welders and cutters (93914) and solderers and brazers (93917).

When an SOC occupation can be constructed exactly from one or a combination of several OES occupations, the OES data was converted to SOC based data. The three years of combined data (1997, 1998, and 1999) was used in estimating wages, while employment estimates will be generated from the single year of 1999 SOC data. If data for an OES occupation can be converted to an SOC occupation, but the SOC occupation cannot be fully constructed from OES data, none of the OES data for that occupation was used in SOC estimates. In the 2000 survey estimates, to be released in early 2001, all survey data used in producing the estimates will be derived from source data originally coded to the SOC-based classification.

Testing

Using the OES to SOC occupational crosswalk, the 1997 and 1998 state data was converted from the OES occupations to the SOC occupations. For testing purposes, occupations classified as non-matches were coded to the SOC major group. Employment and wage estimates using 1999 data only at the SOC major group level were compared to SOC major group estimates produced using three years of data. This major group validation was conducted at the national and state levels. Detailed estimates produced with the

re-coded 1997 and 1998 data were compared with 1998 estimates for the occupations that are one-to-one matches, and SOC estimates from 1999 data alone. This validation process was used to ensure that the occupational data were converted correctly from the OES codes to the SOC codes.

After the 1997 and 1998 master files were converted to SOC occupational codes, and procedures were validated, the data was combined with SOC data collected in 1999 to create wage estimates based on three years of sample data. Occupational wage estimates using a combination of three years of data are footnoted in Table 1 of this publication.

Generation of SOC estimates

The 1999 wage estimates are generated using three years of data wherever possible to improve estimates for small geographic areas. For the occupations that could not be re-coded from OES to SOC, wage estimates are generated from the single year of 1999 data. Further information on the estimation procedure can be found in Appendix B.

Appendix A. The Standard Occupational Classification System

In 1999 the OES survey began using the Office of Management and Budget's new occupational classification system -- the Standard Occupational Classification System (SOC). The SOC system is the first OMB required occupational classification system for Federal agencies. The OES survey uses 22 of the 23 major occupational groups from the SOC to categorize workers in one of almost 770 detailed occupations. The major group excluded is military occupations, which are not surveyed by OES survey. For information about the transition to the SOC in the OES program, please see *Implementing the Standard Occupational Classification in the OES Survey* by Kristine Heffel and Laurie Salmon found in this publication.

Description of the SOC structure

The SOC system uses an empirically based economy-wide occupational classification system. The occupations in the OES system are identified both by titles and by definitions that describe primary job duties. The skill level required for some of the occupations is implicit in the definition.

The SOC system used in this survey was revised in 1998 to better suit the needs of both data users and data producers. The classification system emphasizes occupations of special interest to many data users, such as technology-related occupations and those requiring

substantial training. In addition, it was designed to allow the maximum analytical use of labor force data by various agencies of the U.S. Government, state agencies, professional associations, and private research organizations.

The SOC system has four levels of classification: major group, minor group, broad occupational detail, and detailed occupation. Occupation codes consist of six digits, with a hyphen between the 2nd and 3rd digits for presentation clarity. The first two digits represent the major group; the third the minor group; the fourth and fifth the broad occupational detail, and the last digit, along with the preceding five, identify the detailed occupation. There are residual categories within the various levels of the system to report occupations not identified at the detailed level. The following sections discuss the first level of the system (major group) as well as residual occupational categories.

Major Groups

The major groups and number of detailed occupations of the SOC system surveyed by OES are as follows:

Major occupational group	Occupation	
	Number	Percent of total
Total	769	100.0
Management	30	3.9
Business and financial operations	28	3.6
Computer and mathematical	16	2.1
Architecture and engineering	35	4.6

Life, physical, and social science.....	39	5.1
Community and social services	14	1.8
Legal	9	1.2
Education, training, and library	58	7.5
Arts, design, entertainment, sports, and media	37	4.8
Healthcare practitioners and technical	45	5.9
Healthcare support.....	15	2.0
Protective service	20	2.6
Food preparation and serving related	16	2.1
Building and grounds cleaning and maintenance	9	1.2
Personal care and service	33	4.3
Sales and related	21	2.7
Office and administrative support.....	56	7.3
Farming, fishing, and forestry.....	13	1.7
Construction and extraction	58	7.5
Installation, maintenance, and repair.....	53	6.9
Production	112	14.6
Transportation and material moving	52	6.8

First-line managers and supervisors are included in the last eleven major occupational groups. . Professional, paraprofessional, and technical supervisors are classified with the workers they supervise due to the extensive subject matter knowledge required. First-line managers and supervisors may be supervised by top and middle managers in the managerial and administrative major groups

Residual occupational categories

The SOC system contains occupations that are numerically significant either in one industry, or across all industries. For occupations not meeting one of these standards, residual categories (that is, "All other...") have been created within most levels of the SOC system.

Residual categories provide for a complete accounting of all workers employed within an establishment and allow aggregating and analyzing occupational employment data at various levels of detail. Some examples of residual categories are: "All other sales and related workers" at the major group level, and "All other machinery maintenance mechanics" at the detailed level.

For more information about the SOC, please see the BLS website at http://stats.bls.gov/soc/soc_home.htm.

Appendix B. Survey Methods and Reliability of the 1999 Occupational Employment Statistics Estimates

The Occupational Employment Statistics (OES) survey samples approximately 400,000 establishments each year and, over a 3 year period, contacts approximately 1.2 million establishments. Each single year sample represents one-third of both the certainty and non-certainty strata for the full 3-year sample plan. While estimates can be made from a single year of data, the OES survey has been designed to produce estimates using a full 3 years of data. The sample allows the production of estimates for detailed area, industry, and occupational levels. Estimates using any one year of data are subject to a higher sampling error (due to the smaller sample size) and the limitations associated with having only one-third of the certainty units.

Occupational and industrial classification

New Occupational Classification Standards for 1999: In 1999 the OES survey began using the Office of Management and Budget's new occupational classification system -- the **Standard Occupational Classification System** (SOC). The SOC system is the first OMB required occupational classification system for Federal agencies. The OES survey uses 22 major occupational groups from the SOC to categorize workers in one of almost 770 detailed occupations. Previous years' data was cross-walked to the new classification system when possible and used in producing wage estimates for these occupations. Wages for

374 of the matched occupations are estimated using data from the 1997, 1998, and 1999 surveys. The remaining occupations are either new SOC occupations, or are slightly different from similar occupations in the old OES structure; wages for these occupations are estimated from a single year of data only. In order to maintain employment additivity, all occupational employment estimates are based only on the data collected in the 1999 survey. The major groups of the new SOC system are as follows:

Management occupations

Business and financial operations occupations

Computer and mathematical occupations

Architecture and engineering occupations

Life, physical, and social science occupations

Community and social services occupations

Legal occupations

Education, training, and library occupations

Arts, design, entertainment, sports, and media occupations

Healthcare practitioners and technical occupations

Healthcare support occupations

Protective service occupations

Food preparation and serving related occupations

Building and grounds cleaning and maintenance occupations

Personal care and service occupations

Sales and related occupations

Office and administrative support occupations

Farming, fishing, and forestry occupations

Construction and extraction occupations
Installation, maintenance, and repair occupations
Production occupations
Transportation and material moving occupations
Military specific occupations (not surveyed in OES).

The industrial classification system used in this survey is described in the *1987 Standard Industrial Classification Manual*, whereby reporting establishments are classified into industries on the basis of major product or activity. The OES program produces estimates by both 2-digit and 3-digit SIC and across all industries.

Scope of the survey

Occupational employment data by wage interval are used to produce the 1999 national, State, and area occupational employment and wage estimates by industry. This is the fourth year the OES program has collected both occupational employment and wage data for all nonfarm industries, except private households. The survey covers establishments in Standard Industrial Classification (SIC) codes 07, 10-42, 44-87, 89, and State and local governments. In addition, data for the Postal Service and Federal Government are universe counts obtained from the Office of Personnel Management. Occupational employment and wage estimates at the national level were produced by the Bureau of Labor Statistics using employment and wage data from the 50 States and the District of Columbia. Guam, Puerto Rico, and the Virgin Islands were surveyed; however, data from these territories are not included in the production of national estimates.

The OES survey requests that employers provide occupational data for a particular reference date. The reference date of the 1999 survey is the pay period that included October 12th, November 12th, or December 12th of 1999. The pay period including the 12th day of the reference month is standard for Federal agencies collecting employment data. The reference date for any particular establishment in this survey was dependent on its SIC code. (See table below.)

<i>Reference date</i>	<i>SIC codes of industries surveyed</i>
October 12	07, 15, 16, 17, 241, 472, 50, 51, 52, 53, 541, 542, 543, 545, 546, 549, 55, 56, 57, 58, 59, 60, 61, 62, 637, 655, 672, 673, 679, 70, 722, 731, 732, 733, 734, 736, 738, 792, 793, 794, 799, and 84.
November 12	26, 27, 28, 29, 351, 352, 353, 354, 355, 356, 358, 359, 37, 386, 40, 41, 42, 44, 45, 46, 473, 474, 478, 48, 631, 632, 633, 635, 636, 639, 64, 651, 653, 654, 671, 735, 737, 751, 753, 754, 76, 78, 80, 81, 83, 86, 87, and 89.
December 12	10, 12, 13, 14, 20, 21, 22, 23, 242, 243, 244, 245, 249, 25, 30, 31, 32, 33, 34, 357, 36, 381, 382, 384, 385, 387, 39, 49, 544, 721, 723, 724, 725, 726, 729,

752, 791, 82, and State and local governments.

The employment estimates have been adjusted to the full universe counts of the 1999 survey reference period based on the Covered Employment and Wages program. The 1997 and 1998 wage data have been adjusted to the 1999 reference period by using the national over-the-year fourth quarter rate of change in wages for nine major occupational groups obtained from the Bureau's national Employment Cost Index.

Concepts

An *establishment* is an economic unit that produces goods or services. It is generally found at a single physical location and is engaged predominantly in one type of economic activity. Where a single physical location encompasses two or more distinct activities, these are treated as separate establishments if separate payroll records are available and certain other criteria are met.

Employment includes full- and part-time workers; workers on paid vacations or other types of leave; workers on unpaid short-term absences (that is, illness, bad weather, temporary layoff, jury duty); salaried officers, executives, and staff of incorporated firms; employees temporarily assigned to other units; and employees for whom that unit is their permanent (home) duty station, regardless of whether the unit prepares their paycheck. Among those excluded from coverage are most proprietors

(owners and partners of unincorporated firms), self-employed workers, and unpaid family workers.

Occupation refers to the occupation in which employees are working rather than the occupation for which they may have been trained. For example, an employee trained as an engineer but working as a drafter is reported as a drafter. Employees who perform the duties of two or more occupations are reported in the occupation that requires the highest level of skill or in the occupation where the most time is spent if there is no measurable difference in skill requirements.

Working supervisors (those spending 20 percent or more of their time doing work similar to that performed by workers under their supervision) are reported in the occupation most closely related to their work.

Part-time workers, workers receiving on the job training, and apprentices are reported in the occupation in which they ordinarily work.

A wage is money that is paid or received for work or services performed in a specified period of time. Included in wages for this survey are: base rate; cost-of-living allowance; guaranteed pay; hazardous duty pay; incentive pay, including commissions; piece rates; production bonuses; length of service allowance (longevity pay); on-call pay; portal-to-portal pay; and tips. Not included are: back pay; overtime pay; severance pay; shift differentials; jury duty pay; vacation pay; premium pay for holidays or weekends; attendance bonuses; holiday bonuses; meal and lodging allowances; merchandise discounts; non-production bonuses; profit sharing distributions;

relocation allowances; stock bonuses; tool allowances; tuition reimbursements; or uniform allowances.

Survey procedures

The survey is based on a probability sample, stratified by area, industry, and size of establishment, and is designed to represent the total or "universe" of establishments covered by the survey. The survey is conducted over a 3-year cycle. Each year, one-third of the sample units are included in the survey. To the extent possible, units selected in one year are not included in the sample the following two years.

Employers are asked to classify each of their workers in an occupation and wage range. There are 12 wage ranges as follows:

Interval	Wages	
	Hourly	Annual
Range A	Under \$6.75	Under \$14,040
Range B	\$6.75 to \$8.49	\$14,040 to \$17,679
Range C	\$8.50 to \$10.74	\$17,680 to \$22,359
Range D	\$10.75 to \$13.49	\$22,360 to \$28,079
Range E	\$13.50 to \$16.99	\$28,080 to \$35,359
Range F	\$17.00 to \$21.49	\$35,360 to \$44,719
Range G	\$21.50 to \$27.24	\$44,720 to \$56,679
Range H	\$27.25 to \$34.49	\$56,680 to \$71,759
Range I	\$34.50 to \$43.74	\$71,760 to \$90,999
Range J	\$43.75 to \$55.49	\$91,000 to \$115,439
Range K	\$55.50 to \$69.99	\$115,440 to \$145,599
Range L	\$70.00 and over	\$145,600 and over

Method of collection

Survey schedules are initially mailed out to almost all sampled establishments; personal visits are made to some of the larger establishments.

Two additional mailings are sent to nonrespondents at approximately 3-week intervals. Telephone or personal visit follow-ups are made for those nonrespondents considered critical to the survey because of their size.

Sampling procedures

The sampling frame for this survey was the list of establishments in the 2-digit SIC codes listed above that reported to the State Employment Security Agencies for Unemployment Insurance (UI) purposes. Each quarter, the list from each State is compiled into a single file at BLS. This comprehensive file is called the Universe Database (UDB). The UDB is a compilation of State unemployment insurance reports. Virtually all businesses are required to file this report within the State in which they are located. For the 1997 survey, the sample frame was the UDB file from the third quarter of 1996; for the 1998 survey, it was from the second quarter of 1997; and for the 1999 survey, it was from the second quarter of 1998. This frame was supplemented with a list supplying establishment information on railroads (SIC 401).

A census is taken of Federal Government establishments each year. Data representing Federal Government employment and wages are obtained at the end of the survey process from the Office of Personnel Management.

Within each State, establishments in the universe were stratified by Metropolitan Statistical Area (MSA), 3-digit SIC code, and size of firm. An establishment's size class is determined by its employment on the sampling frame. Establishments in smaller size classes were selected based on a probability sample. Establishments in higher size classes are sampled with virtual certainty across the 3-year cycle of the survey. The targeted sample size of 1.2 million establishments per 3-year cycle was allocated in a manner that equalized the expected relative standard error of the typical occupational employment within each MSA 3-digit SIC cell. Within each of these cells, the sample was allocated across size classes in a manner that minimized the variance of the average typical occupational employment estimate. The OES survey uses permanent random numbers (PRNs) in its sample selection methodology. The purpose of the PRN is to limit, to the extent possible, overlap between the OES survey and other Bureau surveys. These numbers are placed on the frame and are retained by establishments across time. A sample selection using PRNs can be done in several ways. For example, a range of PRNs can be used to select a portion of the universe within each stratum. Alternatively, a specific PRN value can be used as a "start" point within a stratum. Within a stratum sorted by PRN value, n_h establishments are selected sequentially, beginning with this "start" point (where n_h is the number of sample units allocated to stratum h). This latter method is the one used for the OES sample selection. In the OES sample selection, a stratum is defined by State / MSA / 3-digit SIC / employment size class. Approximately

one-third of the allocated units are selected within each MSA/SIC/Size class each year. The above allocation method resulted in initial sample sizes of 408,805, 400,404, and 402,636 establishments for 1997, 1998, and 1999, respectively, for a combined initial sample size of 1,199,353 establishments. Note: the sum of samples across the three years does not equal the combined sample size because only the current years' State and Federal Government establishments are included.

Response

Of the 383,861 eligible units from the 1997 sample, usable responses were obtained from 301,671, producing a response rate of 78.6 percent based on units. Of the 363,267 eligible units from the 1998 sample, usable responses were obtained from 284,159, producing a response rate of 78.2 percent based on units. Of the 369,694 eligible units from the 1999 sample, usable responses were obtained from 286,903, producing a response rate of 77.6 percent based on units.

Nonresponse

Nonresponding establishments are accounted for in the OES survey by a two step imputation process. First, the staffing pattern is imputed using a hot-deck "nearest-neighbor" imputation method. Hot-deck procedures utilize data from the current time period to impute for missing data (from the current time period). The "nearest-neighbor" method searches the responding establishments within a defined cell and finds the responding

establishment that most closely matches the nonresponding establishment for key classification values (area / SIC / size class). The staffing pattern, or employment distribution, of the responding establishment is used as the staffing pattern of the nonresponding establishment. The second step is to impute a wage distribution for each occupation of the imputed staffing pattern. This imputation procedure replaces the missing data by determining the distribution of the reported occupational wage data across wage intervals in the current area / SIC / size class. If there are sufficient data at this level the procedure uses this reported wage distribution to allocate the nonrespondent's imputed occupational employment across the wage intervals. If there are not enough data, the pool of donors is expanded to include adjacent size classes, industries, and areas until a distribution can be determined.

Occasionally a responding establishment may provide employment information, but refuse to provide wage distribution information for selected occupations. The OES survey uses the distribution within a cell procedure described above to impute the missing data for this partial report.

Combining and benchmarking multi-year data

Whenever possible, data from the 1997, 1998, and 1999 surveys have been combined. Survey data from 1997, 1998, and 1999 were used to produce the wage estimates for 374 occupations. The remaining occupational wage estimates and all of the employment estimates were produced using only

the 1999 data. Each year's sample is weighted to represent the sample as it appeared at the time the sample was selected. In order to combine the data, each unit's weight is modified so that the aggregate sample represents the universe. This is done via a fairly simple procedure. Each unit's weight is divided by the number of years that sample units were selected for that stratum.

A ratio estimator is used to develop estimates of occupational employment. The auxiliary variable used was the 1999 reference-month population value of total employment. In order to balance the State's need for estimates at different levels of geographic and industrial aggregation, the ratio adjustment process was applied as a hierarchical series of ratio adjustment factors, or "benchmark" factors.

The primary component of this procedure is a ratio adjustment at the State, MSA, 3-digit SIC, employment size class level. If these ratio adjustment values are out of range, they are set at predetermined maximum or minimum values. This adjustment can be described as follows:

define

h = State/MSA/3-digit SIC

H = State/3-digit SIC

s = one of four employment size classes {1-19, 20-49, 50-249, 250+}

S = one of two aggregate employment size classes {1-49, 50+}

M = 1999 reference month population value of total employment

i = establishment

w_i = adjusted sample weight for establishment i

p_i = total establishment employment

BMF_{\min} = a parameter, the lowest value allowed for BMF

BMF_{\max} = a parameter, the highest value allowed for BMF, and

$$\beta_{hs} = \left(M_{hs} / \sum_{i \in hs} w_i p_i \right), \quad \beta_{hS} = \left(M_{hS} / \sum_{i \in hS} w_i p_i \right), \quad \beta_h = \left(M_h / \sum_{i \in h} w_i p_i \right), \text{ then}$$

$$BMF_{1,hs} = \begin{cases} \beta_{hs}, & \text{if all } \beta_{hs} \text{ within } h \text{ are bounded by } (BMF_{\min}, BMF_{\max}), \\ \beta_{hS}, & \text{if all } \beta_{hS} \text{ within } h \text{ are bounded by } (BMF_{\min}, BMF_{\max}), \\ BMF_{\min}, & \text{if } \beta_h < BMF_{\min}, \\ BMF_{\max}, & \text{if } \beta_h > BMF_{\max}, \\ \beta_h & \text{otherwise} \end{cases}$$

The next component in the procedure is a ratio adjustment at the State, 3-digit SIC level using the product of the adjusted sampling weight and the first ratio adjustment as a final weight value. If these ratio adjustment values are out of range, they are set at predetermined maximum or minimum values. This ratio adjustment accounts for weighted, ratio-adjusted sample employment which does not adequately represent the universe within one or more of the State, MSA, 3-digit SIC strata. This adjustment is calculated as follows:

define

$$\beta_H = \left(\frac{M_H}{\sum_{hs \in H} \sum_{i \in hs} w_i p_i BMF_{1,hs}} \right), \text{ then}$$

$$BMF_{2,H} = \begin{cases} BMF_{\min}, & \text{if } \beta_H < BMF_{\min}, \\ BMF_{\max}, & \text{if } \beta_H > BMF_{\max}, \\ \beta_H & \text{otherwise} \end{cases}$$

The procedure then calculates a ratio adjustment at the State, 2-digit SIC level using the product of the adjusted sampling weight, the first ratio adjustment, and the second ratio adjustment as a final weight value. If these ratio

adjustment values are out of range, they are set at predetermined maximum or minimum values. This ratio adjustment accounts for weighted, ratio-adjusted sample employment, which does not adequately represent the universe within one or more of the State, 3-digit SIC strata. This adjustment is calculated similar to $BMF_{2,H}$.

Finally, the procedure calculates a ratio adjustment at the State, industry-division level using the product of the adjusted sampling weight, the first ratio adjustment, the second ratio adjustment, and the third ratio adjustment as a final weight value. If these ratio adjustment values are out of range, they are set at predetermined maximum or minimum values. This ratio adjustment accounts for weighted, ratio-adjusted sample employment, which does not adequately represent the universe within one or more of the State, 2-digit SIC strata. This adjustment is also calculated similar to $BMF_{2,H}$.

A final ratio adjustment factor, BMF_k , is calculated as the product of the four hierarchical ratio adjustment factors. That is, $BMF_k = BMF_1 * BMF_2 * BMF_3 * BMF_4$. A final weight value is then calculated as the product of the adjusted sample weight and the final ratio adjustment factor. Note that the population values of total employment (M_{hs}) are obtained from the Bureau's Universe Data Base (UDB) file.

Estimation methodology

Producing estimates using the 3 years of sample data provides additional occupational detail and sampling error reductions (particularly for small geographic areas and

occupations). However, this procedure also has some quality limitations because it requires the adjustment of earlier years' data to the current reference period--a procedure referred to as "wage updating."

The 1997 OES survey estimates were from the second year of OES estimates and were developed using both the 1996 and 1997 surveys. The 1997 estimates also represented the first year of using a "wage-updating" methodology in developing the OES survey estimates. In addition to the wage-updating procedure, the 1997 estimates used an improved estimation methodology, which uses a "nearest neighbor" imputation approach for nonrespondents and applies employment benchmarks at a detailed MSA by 3-digit industry and broad size class level. A variant of the imputation procedure is also used to account for item nonresponse. It should be noted that because of the difference in estimation methods for these first 2 years of OES estimates, the estimates for 1997 are not strictly comparable with those published for 1996.

The 1998 OES survey estimates are developed from the full three years of the OES sample. The combined 1996, 1997, and 1998 data cover approximately 1.2 million sample units. The 1998 estimates use the wage-updating methodology introduced in 1997, which uses the over-the-year fourth-quarter rate of change in wages for nine major occupational groups from the Bureau's Employment Cost Index to adjust prior years' wage data to the current year's reference period. In addition, the 1998 estimates use the estimation methodology introduced in 1997, which uses a "nearest neighbor" imputation approach for nonrespondents

and applies employment benchmarks at a detailed MSA by 3-digit industry and broad size class level.

The 1999 OES survey wage estimates for some occupations are developed from the full three years of the OES sample, while the remaining occupational wage estimates and all of the employment estimates are from one year of data. The combined 1997, 1998, and 1999 data cover approximately 1.2 million sample units. The 1999 estimates also use the wage-updating and estimation methodology introduced in 1997.

Estimated employment

As mentioned above, a ratio estimator is used to develop estimates of occupational employment. The auxiliary variable is the population value of total employment obtained from the refined Unemployment Insurance files for the 1999 reference month. Within each MSA, the estimated employment for an occupation at the reported 3-digit SIC level was calculated by multiplying the weighted employment by its ratio factor. The estimated employment for an occupation at the all-industry level was obtained by summing the occupational employment estimates across all industries within an MSA reporting that occupation. The employment and wage data for Federal Government workers in each occupation were added to the survey derived data.

First, within each MSA the estimated employment for an occupation at the reported 3-digit SIC i level was calculated using the following equation:

$$\hat{P}_{oi} = \sum_j \sum_k (w_{ijk} p_{oijk}) * BMF_k$$

where

- o = occupation
- i = reported 3-digit SIC
- j = reported size class
- k = establishment
- w_{ijk} = adjusted sample weight for establishment

k

p_{oijk} = reported employment for occupation o
in establishment k within SIC i and
size class j

\hat{P}_{oi} = estimated employment for occupation o in
SIC i

The estimated employment for an occupation at the all-
industry level was obtained by summing the occupational
employment estimate \hat{P}_{oi} across all industries within an MSA
that reported that occupation. See the formula below.

$$\hat{P}_o = \sum_{i=1}^{L_i} \hat{P}_{oi}$$

where L_i is the number of industries reporting that
occupation within the MSA.

Estimated wage rates

Occupational wage data in the OES survey are collected
as the number of workers in an occupation who are paid

wages within each of 12 contiguous wage intervals. For example, an establishment may report that it employs 10 secretaries: 2 in wage interval B, paid wages between \$6.75 and \$8.49 per hour; 6 in wage interval D, paid wages between \$10.75 and \$13.49 per hour; 2 in wage interval E, paid wages between \$13.50 and \$16.99 per hour. As a result, individual wage rates of workers are not collected. Conventional arithmetic mean formulae are not applicable in this situation. Because wage data are collected within an interval matrix, the particular wage rate of all employees within an interval is approximated by a mean wage rate value for the interval for each of the first 11 wage intervals. Data from the BLS the National Compensation Survey (NCS) are used to calculate these mean wage rate values. The mean wage value for the upper open-ended wage interval was Winsorized, that is, it was set at that interval's starting point. Occupational wage rates are calculated by summing a weighted estimate of total occupational wages, and dividing that by a weighted estimate of total occupational employment.

Wage updating process. Because data from 3 years were used to produce the 1999 OES wage estimates for some occupations, a process was used to update prior year information so that it would be representative of the 1999 reference period. This was done by adjusting most 1997 and 1998 wage data by a factor developed from the Bureau's Employment Cost Index (ECI) program. The ECI program provides a rate of change in wages from fourth quarter 1997 to fourth quarter 1999 and fourth quarter 1998 to fourth

quarter 1999 for nine major occupational groups. Each OES occupation belongs to one of these major occupational groups. These rates of changes were used to update the 1997 and 1998 OES data to the 1999 reference period.

Estimated mean wage rate. Mean wage is the estimated total wages for an occupation divided by its weighted survey employment. An estimate of the mean wage rate was calculated by using a standard interval-based estimation formula, modified to account for the wage-updating process. See the formula below.

$$\hat{R}_o = \frac{\sum_{yr} \sum_{k \in yr} w_k \hat{y}_{k o}}{\hat{P}_o}, \text{ where } \hat{y}_{k o} = uf_{yr,o} \sum_r p_{k,o,r} c_{yr,r}; (k \in yr)$$

where

- o** = Occupation
- w_k = weight for establishment k
- yr = year
- r = wage interval
- $p_{k, o, r}$ = reported employment for occupation o in establishment k in wage interval r. Note that establishment k reported data for one year (yr)
- $\hat{y}_{k o}$ = unweighted total wage estimate for occupation o in establishment k
- \hat{P}_o = estimated employment for occupation o
- $uf_{yr,o}$ = ECI updating factor for year yr and occupation o
- $c_{yr,r}$ = see below

In this formula $c_{yr,r}$ represents the mean of interval r for year yr . This mean was determined empirically through research on an auxiliary data set based on the NCS survey. The research is described in the report 'A Study of the Wage Intervals and Estimation Methods Used to Estimate Mean and Median Wage Rates in the OES Survey' an unpublished internal BLS study dated April 4, 1997.

Median wage is the estimated 50th percentile of the distribution of wages; 50 percent of workers in an occupation earn wages below, and 50 percent earn wages above the median wage. The wage interval containing the median wage is located using a cumulative frequency count of employment across wage intervals. After the targeted wage interval is identified, the median wage rate is then estimated by a linear interpolation procedure.

Variance of estimates

Estimates of sampling error are calculated to allow the users to determine if occupational employment estimates are reliable enough for their needs. Only a probability-based sample can be used to calculate estimates of sampling error from the sample itself.

The formula used to estimate variances (a common measure of sampling error) is based on the survey's sample design and method of estimation. The OES survey used a subsample replication technique called the jackknife random group to estimate variances of occupational employment. In this technique each sampled establishment is assigned to

one of G random groups. Using the data in these groups, G subsamples are formed from the parent sample. Next, G estimates of total employment for an occupation P are calculated, one employment estimate per subsample. Afterwards, the variability of these G employment estimates is calculated. This variability is our variance estimate of occupation P's employment estimate.

The variance estimate of an occupational employment estimate at the reported 3-digit SIC i/reported size class j level is calculated using the following equation:

$$s^2(\hat{P}_{ij}) = \left[\sum_{g=1}^G (\hat{P}_{ijg} - \bar{\hat{P}}_{ij})^2 \right] / [G(G-1)]$$

where $s^2(\hat{P}_{ij})$ = estimated variance of \hat{P}_{ij}
 G = number of random groups
 \hat{P}_{ij} = estimated employment for occupation p in SIC i and size class j
 \hat{P}_{ijg} = estimated employment for occupation p in SIC i, size class j, and subsample g
 $\bar{\hat{P}}_{ij}$ = estimated mean employment for occupation p in SIC i and size class j based on the G subsamples

Note: a finite population correction factor is applied to the terms \hat{P}_{ijg} and $\bar{\hat{P}}_{ij}$.

The variance for an occupational employment estimate at the reported 3-digit SIC i level was obtained by summing the variance $s^2(\hat{P}_{ij})$ across all reported size classes j in SIC i.

Similarly, the variance for an occupational employment estimate at the reported 2-digit SIC h level is obtained by summing the variance $s^2(\hat{P}_i)$ across all reported 3-digit SICs i within SIC h.

Reliability of the estimates

Estimates developed from a sample may differ from the results of a census. Two types of error, sampling and nonsampling, can occur in estimates calculated from a sample. *Sampling error* occurs because our observations are based on a sample, not on the entire population. *Nonsampling error* occurs because of response and operational errors in the survey. Unlike sampling error, this form of error can also occur in a census.

Sampling errors

The particular sample used in this survey is one of a large number of many possible samples of the same size that could have been selected using the same sample design. Estimates derived from different samples would tend to differ from one another. The variance of a survey estimate is a measure of the variation among the estimates from all possible samples. The standard error of a survey estimate is the square root of its variance; the relative standard error is the ratio of the standard error to the estimate itself.

The sample estimate and its standard error allows the user to construct an interval estimate with a prescribed level of confidence that the interval will include the mean value of the estimate from all possible samples.

To illustrate, if all possible samples were selected, and if each of these were surveyed under essentially the

same conditions, and an estimate and its estimated standard error are calculated from each sample, then:

1. Approximately 68 percent of the intervals from one standard error below to one standard error above the derived estimate would include the average value of the estimates from all possible samples. This interval is called a 68-percent confidence interval.
2. Approximately 90 percent of the intervals from 1.6 standard errors below to 1.6 standard errors above the derived estimate would include the average value of the estimates from all possible samples. This interval is called a 90-percent confidence interval.
3. Approximately 95 percent of the intervals from two standard errors below to two standard errors above the derived estimate would include the average value of the estimates from all possible samples. This interval is called the 95-percent confidence interval.
4. Almost all (99.7 percent) of the intervals from three standard errors below to three standard errors above the derived estimate would include the average value of the estimates from all possible samples.

For example, suppose that an estimated occupational employment total is 5,000 with an associated relative standard error of 2.0 percent. Based on these data, the standard error of the estimate is 100 (2 percent of 5,000). A 68-percent confidence interval for the employment estimate is (5,000 +/- 100) or (from 4,900 to 5,100). Approximately 68 percent of the intervals constructed in

this manner will include the mean of all possible employment estimates as computed from all possible samples. A 95-percent confidence interval for the employment estimate is (5,000 +/- 200) or (4,800 to 5,200). Approximately 95 percent of the intervals constructed in this manner will include the mean of all possible employment estimates as computed from all possible samples. Estimates of sampling errors for occupational employment estimates are provided with this publication.

Nonsampling error

This type of error is attributable to several causes such as: an inability to obtain information for all establishments in the sample; differences in the respondents' interpretation of the survey question; an inability or unwillingness of the respondents to provide correct information; errors made in recording, coding, or processing the data; and errors made in imputing values for missing data. Explicit measures of the effects of nonsampling error are not available.

Several edit and quality control procedures are used to reduce nonsampling error. For example, completed survey questionnaires are checked for data consistency. Follow-up mailings are sent out to nonresponding establishments to improve the survey response rate. Response analysis studies are conducted to assess the respondents' comprehension of the questionnaire. See the section below for additional information on the quality control procedures used by the OES survey. The relative standard error indicates the magnitude of the sampling error. It

does not measure nonsampling error, including any biases in the data. Particular care should be exercised in the interpretation of small estimates or in small differences between estimates when the sampling error is relatively large or the magnitude of the bias is unknown.

Quality control measures

The OES survey is a Federal-State cooperative effort that enables States to conduct their own surveys. A major concern with a cooperative program like OES is to accommodate the needs of BLS and other Federal agencies, as well as State-specific publication needs, with limited resources while simultaneously standardizing survey procedures across all 50 States, the District of Columbia, and the U.S. territories. Controlling sources of nonsampling error in this decentralized environment can be difficult. One important computerized quality control measure used by the OES survey is the Survey Processing and Management (SPAM) System. It was developed to provide a consistent and automated framework for survey processing and to reduce the workload for analysts at the State, regional, and national levels.

To ensure standardized sampling methods in all areas, the sample is drawn in the national office. Standardizing data processing activities such as validating the sampling frame, allocating and selecting the sample, refining mailing addresses, addressing envelopes and mailers, editing and updating questionnaires, electronic review, producing management reports, and calculating employment

estimates resulted in the standardization of the OES survey methodology. This has reduced the number of errors on the data files as well as the time needed to review them.

Other quality control measures used in the OES survey include:

- Follow-up solicitations of nonrespondents (especially critical nonrespondents)
- Review of schedules to verify the accuracy and reasonableness of the reported data
- Adjustments of atypical reporting units on the data file
- Validation of the benchmark employment figures and of the benchmark factors
- Validation of the analytical tables of estimates (at the 2- and 3-digit SIC levels)

Confidentiality

The Bureau of Labor Statistics has a strict confidentiality policy that assures the survey sample composition, lists of reporters, and names of respondents shall be kept confidential. Additionally, the order assures respondents that published figures will not reveal the identity of any specific respondent, and will not allow the data of any specific respondent to be imputed from the published figures. Each published estimate is screened to ensure that it meets these confidentiality requirements. The specific screening criteria are not listed in this publication to further protect the confidentiality of the data.

Appendix C. Availability of Historical Occupational Employment Statistics Survey Data Nationally and From State Agencies

The Occupational Employment Statistics survey first collected employment and wage data in 1996 to produce occupational estimates for all industries and also to produce occupational wage data for all States. Prior to 1996, the OES survey collected data from specified industries in 1 of 3 years in the survey round, as indicated in the table below. Now the survey sample is designed to collect data from establishments in all industries each year.

Industry	1987 SIC code	Years collected
Agricultural services	07	1992, 1995
Mining	10-14	1978, 1981, 1984, 1987, 1990, 1993
Construction	15-17	1978, 1981, 1984, 1987, 1990, 1993
Manufacturing	20-39	1977, 1980, 1983, 1986, 1989, 1992, 1995
Transportation and public utilities	40-49	1979, 1982, 1985, 1988, 1991, 1994
Wholesale trade	50-51	1979, 1982, 1985, 1988, 1991, 1994
Retail trade	52-59	1979, 1982, 1985, 1988, 1991, 1994
Finance, insurance, and real estate	60-67	1978, 1981, 1984, 1987, 1990, 1993
Services	70-87, 89	1978, 1981, 1984, 1987, 1990, 1993
Hospitals	806	1980, 1983, 1986, 1989, 1992, 1995
Educational services	82	1978, 1981, 1985, 1988, 1991, 1994
State government		1979, 1982, 1985, 1988, 1991, 1994
Local government		1979, 1982, 1985, 1988, 1991, 1994

States also produce occupational estimates by industry. Prior to 1983, not all States participated in the OES program in all survey years. Starting with the 1991 OES survey, certain States also collected wage data. In 1996, all States started collecting wage data. Check with the State employment security agencies regarding the availability of State data on occupational employment and wages.

