

1-29-2014

# The Relationship between Obesity and Occupations among the U.S. Population Based on Occupational Tasks

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## Recommended Citation

Flaherty, Luz D., "The Relationship between Obesity and Occupations among the U.S. Population Based on Occupational Tasks" (2014). *Master's Theses*. 537.  
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The Relationship between Obesity and Occupations among the U.S. Population Based on  
Occupational Tasks

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B.S.MT, University of Puerto Rico, 1996

A Thesis

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Master in Public Health

at the

University of Connecticut

2014

APPROVAL PAGE

Master of Public Health Thesis

The Relationship between Obesity and Occupations among the U.S. Population Based on  
Occupational Tasks

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2014

## **ACKNOWLEDGEMENTS**

This thesis was developed with the guidance and support received from faculty members. I am deeply thankful to my advisors, Dr. Tim Morse, Dr. Nick Warren and Joan Segal. I am grateful for having their assistance and support.

I want to give special recognition to Tim Morse for presenting this idea and allowing me to develop this exploratory study. His broad knowledge and experience was a great asset during the project.

It is imperative to mention the collaboration of Dr. Alberto Caban. His research study “Obesity in U.S. workers: The national health interview survey” was the foundation of this thesis. Although, he is not a faculty member at the University of Connecticut, he was always accessible and ready to assist during the progress of the study. In addition, the collaboration of Dr. John Meyer had a significant impact on this thesis. He provided his broad knowledge and expertise with regards to ONET and other national occupational data available.

This research study was done using a national data base. This project would not be possible without the mentoring and collaboration of this excellent group of professionals.

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## **ABSTRACT**

American society could be considered an “obesogenic society” due to the continuous growth of obesity prevalence among the population. Obesity can decrease the life span and is associated with a variety of medical conditions such as diabetes, cardiovascular diseases and musculoskeletal diseases. The obesity issue has become common and costly across the country. In 2010, every state in the United States of America had an obesity prevalence of at least 20%. Biological, genetic, behavioral and environmental factors may all influence obesity prevalence.

Overweight and obesity rates are commonly based on “body mass index” (BMI). Obesogenic jobs are defined as jobs with characteristics that contribute to increased obesity prevalence among employees. These job characteristics may include pressures and demands and overall stress, work environment, food availability, inactivity, or low physical activity levels, and occupational hazards. In addition, socio-economic differences, which are partially based on pay levels, could contribute to obesity.

This exploratory study used national data sets on occupations and mean hourly wage available on the Bureau of Labor Statistics website. The occupational tasks data was gathered from the O\*NET resource center. Statistical analysis was performed to test the association between occupational tasks and obesity prevalence. Positive associations were found for several tasks that involved physical activity as well as a few tasks related to managerial duties (Table 9). Three factors were derived from factor analysis: physical demands, substantive complexity (“job control”) and work with people vs. things. Out of the three factors, only the physical demands factor was significantly associated with obesity prevalence. Further research is necessary to confirm and expand the findings of

this project.

Based on these findings, worksite interventions may be helpful in addressing the obesity epidemic in American society. Modifying occupational tasks, providing appropriate training as well as improving work environment and promoting healthy behaviors through education and incentives could be a good start to decreasing the obesity rate across occupational groups.

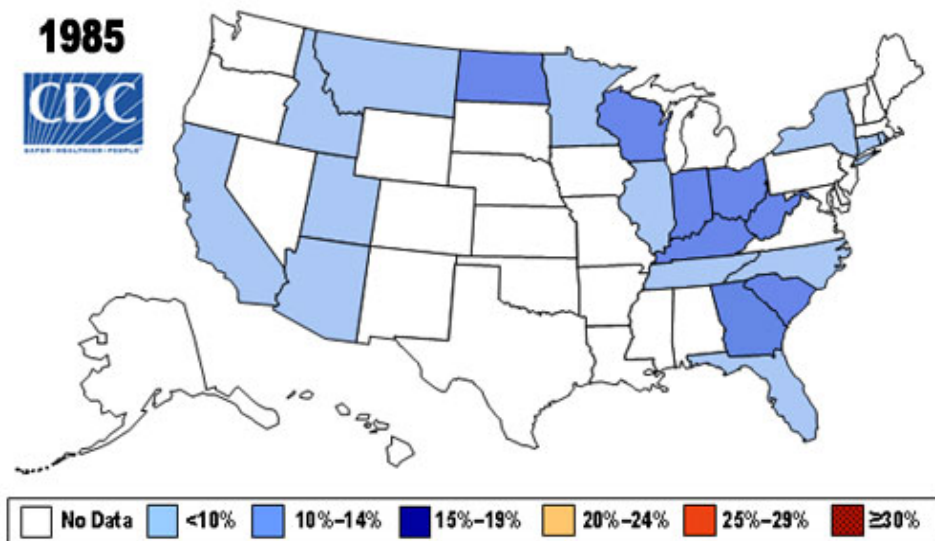
## **Introduction**

American society could be considered an “obesogenic society” due to the continuous growth of obesity prevalence among the population. Obesity has been identified as the seventh leading cause of death among the American population (Williams and Finucane, 2007). Williams, et al. (2007) found that obesity increases the odds of developing physical and psychological illnesses as well as promoting economic issues that eventually increase mortality rates. The obesity epidemic generates consequences more severe than smoking or alcohol (Sturm and Andrejeva, 2004). It has been estimated that obesity can decrease the average life span among the American population by up to five years (Williams and Finucane, 2007). Obesity is considered a significant contributor to overall mortality as well as chronic diseases such as cancer, diabetes mellitus, cardiovascular disease and musculoskeletal disorders (Ostbye and Krause, 2007).

Healthy weight depends on body type and height. Body mass index or BMI is used to determine weight stage; normal or healthy, overweight and obese (WebMD, 2013). (The body mass index is described in more detail later in this paper in Tables 1 and 2.) A person with 20% more than the recommended weight is considered obese (MedPUB, 2013). The obesity rate has dramatically increased across the country during the last two decades (CDC, 2012). In 2010, every state in the United States had an obesity prevalence of at least 20%, with 36 states above 25% and 12 states above 30% (CDC, 2012); see Figures 1 to 4. The obesity rate is more prevalent among minority groups than non-Hispanic Whites (Siegel, et al., 2010). The elevated obesity rate has turned into a top public health issue in the United States, with rates increasing

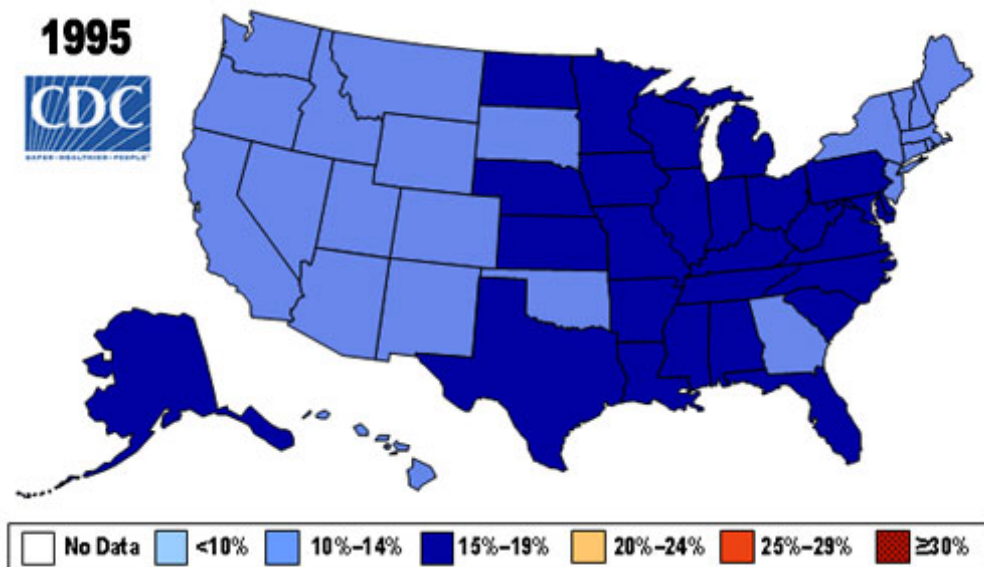
consistently over the last several decades (Schulte, et al. 2007). In summary, obesity among the American population is a very common, serious and costly issue (CDC, 2012).

**Figure1: Percent Obese (BMI  $\geq 30$ ) U.S. Adults, 1985**



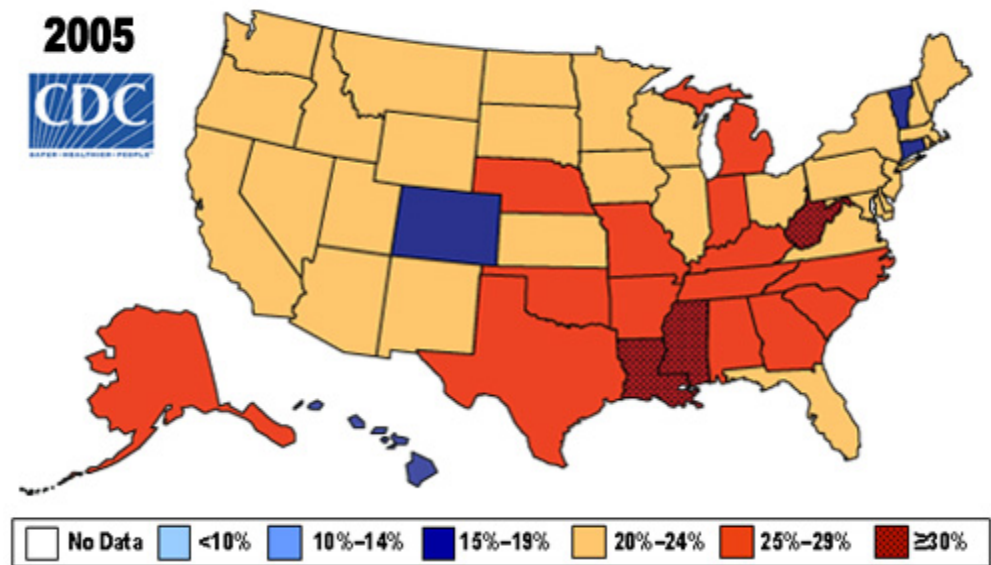
Source: [http://www.cdc.gov/obesity/data/animated\\_map\\_slides/map1.jpg](http://www.cdc.gov/obesity/data/animated_map_slides/map1.jpg)

**Figure2: Percent Obese (BMI  $\geq 30$ ) U.S. Adults, 1995**



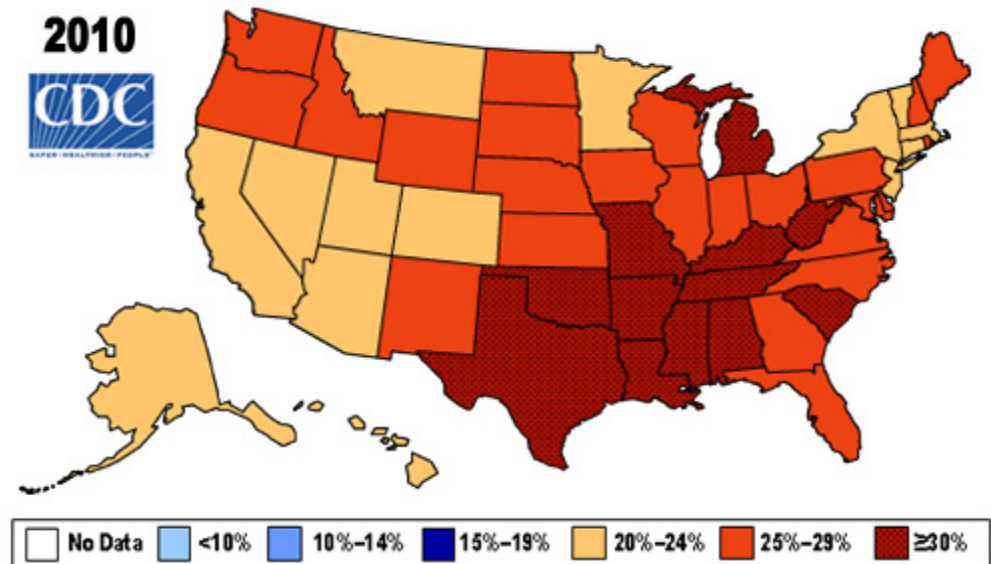
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Figure3: Percent Obese (BMI  $\geq 30$ ) U.S. Adults, 2005



Source: [http://www.cdc.gov/obesity/data/animated\\_map\\_slides/map21.jpg](http://www.cdc.gov/obesity/data/animated_map_slides/map21.jpg)

Figure4: Percent Obese (BMI  $\geq 30$ ) U.S. Adults, 2010



Source: [http://www.cdc.gov/obesity/data/animated\\_map\\_slides/map26.jpg](http://www.cdc.gov/obesity/data/animated_map_slides/map26.jpg)

## ***Definitions***

The terms overweight and obesity are used when a person's weight exceeds the established healthy weight range according to height. An individual is considered overweight when the body weight is 10% to 20% above the desirable or recommended weight and obese when weight exceeds 20% of the recommended weight (Heiat, 2003; Bresnahan and Saad, 2013). Flegal, Carroll, and Johnson (2002) estimated that 64% of the adult population in the United States is either overweight or obese.

The Centers for Disease Control and Prevention (CDC) as well as other researchers typically classify obesity based on "body mass index" (BMI). The formula for BMI is weight divided by the square of height, which correlates with the amount of body fat (see Table 1) (CDC, 2012). The ideal BMI is 18.7 to 24.9 for the general adult population (Heiat, 2003). Older adults have the tendency to have a higher BMI than a comparable young or middle-aged person (Heiat 2003). A person with a BMI between 25.0 and 29.9 is considered overweight and someone with BMI greater than or equal to 30 is considered obese (CDC, 2012). (See Table 2 for BMI categories.) The combined overweight and obesity classifications relate well to the 20% or more above the recommended weight earlier established (Heiat, 2003). Figure A1, in the Appendix section, shows the BMI Reference Chart. Research by the CDC and others had shown that certain individuals, such as body builders, could be more than 20% above their recommended weight, but not be overweight due to their developed muscles and the relatively higher mass of muscle to fat.

**Table 1: BMI formula**

Measurement Units	Formula and Calculation
<b>Kilograms and meters (or centimeters)</b>	<p>Formula: <math>\text{weight (kg)} / [\text{height (m)}]^2</math></p> <p>The metric system formula for BMI is weight in kilograms divided by height in meters squared. If height is measured in centimeters, divide centimeters by 100 to obtain height in meters.</p> <p>Example: Weight = 68 kg, Height = 165 cm (1.65 m)</p> <p>Calculation: <math>68 \div (1.65)^2 = 24.98</math></p>
<b>Pounds and inches</b>	<p>Formula: <math>[\text{weight (lb)} / \text{height (in)}]^2 \times 703</math></p> <p>Calculate BMI by dividing weight in pounds (lbs) by height in inches (in) squared and multiplying by a conversion factor of 703.</p> <p>Example: Weight = 150 lbs, Height = 5'5" (65")</p> <p>Calculation: <math>[150 \div (65)^2] \times 703 = 24.96</math></p>

Source: [http://www.cdc.gov/healthyweight/assessing/bmi/adult\\_bmi/index.html#Interpreted](http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html#Interpreted)

**Table 2: BMI categories**

BMI	Category
<b>Below 18.5</b>	<b>Underweight</b>
<b>18.5 to 24.9</b>	<b>Healthy weight</b>
<b>25.0 to 29.9</b>	<b>Overweight</b>
<b>30.0 or higher</b>	<b>Obese</b>

Source: <http://www.cdc.gov/obesity/adult/defining.html>

### *Factors Influencing Obesity*

Factors that could influence the development of obesity can be categorized as biological, genetic (the gene GAD2) (Boutin, and Froguel, 2003), metabolic (imbalance between caloric intake and energy consumption or expenditure), behavioral (eating habits and physical activity), cultural (food choices), socioeconomic (food portion size) and environmental (stress) (CDC, 2012).

Genetics have a relevant impact on obesity; however, heritability is directly affected by the level of activity (Overgaard and Heitmann, 2006). Oversized portions and reduced physical activity have been linked to the increasing obesity crisis in the United States (Vega, 2007). Greater food consumption is the most important factor for the growing obesity epidemic (Church, et al., 2011). Social and behavioral factors are also important (Vega, 2007). For example, minimizing the consumption of fast food and adding five or more fruit and vegetable servings daily could help people avoid adding extra weight (Kruger, and Gillespie, 2008). Often people have the need to choose easy and less expensive food, which contributes to obesity development. Consumption of fast food increases the risk of becoming obese (Vega, 2007).

Education has an inverse relationship to obesity; lower educational and income levels have been related to higher obesity (Vega, 2007). Similarly, groups with low occupational status and less education have a higher risk of becoming obese (Sarlio-Lahteenkorva, Inge, and Eero, 2005).

Because obesity is associated with many different factors, it may be very complicated and difficult to create effective comprehensive intervention programs.



Obesity has become a worldwide problem (Schulte, et al., 2007), although studies have failed to prove the existence of a clear positive association between being overweight and mortality (Heiat, 2003).

### ***What are “Obesogenics jobs”?***

Obesogenic means “generating obesity”. The term “obesogenic jobs” refers to certain jobs that are more likely to contribute to increased obesity prevalence among employees. Obesity among employed adults may be related to some occupational characteristics (Vega, 2007). The workplace is considered an important aspect of the obesity issue because an average employee spends 25% of his or her life at the workplace (Schulte, 2007) and the influence of work environment over employees’ behavior and health increases the chances for them to become obese (Vega, 2007). The productivity of obese workers is lower than that of lean or overweight workers, although productivity is comparable between lean and overweight employees (Bernaards, Proper, and Hildebrandt, 2007).

Pressures and demands generated at work could affect the food intake and physical activity of the employee (Schulte, 2007). However, changes in BMI have not been associated with sickness or job retention ((Bernaards et al., 2007).

Some of the potential linkages between job characteristics and obesity rate include stress, physical demands, work environment, food availability, food selection, social support at the work place, salary level and work hazards.

### ***Stress***

Several research studies have associated obesity with elevated stress levels. Eating habits may be negatively affected by the level of job stress or responsibility, thus

increasing the chance to be obese (Schulte, et al., 2007). Stress-induced eating may contribute to weight gain and ultimately obesity (Overgaard and Heitmann, 2006). Elevated stress levels have been related to behavioral changes that lead to excessive food intake, resulting in weight gain (Vega, 2007). Increased work demands and elevated work expectations may directly affect the employees' stress level (Barlow, 2011). Job demands are considered psychological stressors at the workplace (Hussain and Khalid, 2011). Elevated levels of job demands along with low influence at the workplace have an impact on food intake leading to weight gain (Overgaard, et al., 2006).

At the same time, employees with very low busyness at the workplace experience greater weight gain than those who are moderately busy (Overgaard and Heitmann, 2006). Thus, it is important to maintain a balance between busyness and downtime at the workplace.

The combination of occupational strain along with a genetic predisposition increases the chance for an individual to be obese (Overgaard, et al., 2006). Work environments with high demands, low control and long or prolonged work shifts increase risk for obesity development (Schulte, et al., 2007). Occupational pressures and demands could negatively affect employees' eating habits and activity patterns since they spend 25% of their lives at work (Schulte, et al., 2007).

Lack of social support in the workplace may be one of the most relevant factors of job strain in increasing the risk of obesity (Vega, 2007). Obese workers experience more problems in integrating to the workplace and getting along with peers, affecting the development of social support in the workplace (Bernard, 2007).

Psychological tension and anxiety are often derived from increased demands and low decision latitude at work. Low decision latitude has been associated with sedentary behavior (Vega, 2007). Similarly, Overgaard concluded that psychological demands in the workplace influence weight gain (Overgaard, 2006). The risk for obesity increased by an odds ratio of 1.73 when an individual experiences elevated work strain and the relationship between stress and obesity was found to have a dose-response relationship (Vega, 2007). Occupational stress was also associated with a slightly increased risk of physical inactivity (Kouvonen, et al., 2012), which may indicate an intermediate mechanism.

Work stress may vary depending on the kind of job or industry involved (NIOSH, 2002). Industries with the highest percentage of poor mental health due to job demands include retail trade, transportation and public utility, manufacturing, services, agriculture, forestry, fishing, construction, finance, insurance, real estate and wholesale trade (NIOSH, 2011).

### ***Food Availability***

Food selections in the work place may influence employees' weight. Food access and availability may vary by job environment or by management commitment to healthy food choices (e.g., dependence on vending machines or take-out food), or by pricing incentives (particularly for low wage workers). Obesity risk increases when restaurant or cafeteria dining is chosen over homemade food (Vega, 2007). Oversized portions, as well as high calorie and fatty dishes, contribute to obesity (Vega, 2007).

A positive association has been found between portion size and obesity (Rodriguez and Fiates, 2012). Oversize portions contribute to the obesity issue by

providing greater energy intake and contributing to an imbalance between energy intake and expenditure (Rolls, Morris, and Roe, 2002). Caloric intake has been found to be an important factor influencing weight gain (Church, et al., 2011). However, food portion size is a modifiable determinant of energy intake that could be adjusted to generate a balance between energy intake and energy expenditure (Rolls, Moris, and Roe, 2002).

People's decisions about food choices are also likely to be driven by food cost (French, et al., 2010). Quick, easy and less expensive food selections are often preferred when dining in the workplace (Vega, 2007).

### ***Physical Activity***

Physical inactivity has been linked to obesity, as well as to lower work productivity and greater absence from work due to sickness (Bernaard et al., 2007). Obese employees also experience a higher degree of work limitations and thus likely lower work productivity (Sturm, Ringel, and Andreyeva, 2004).

Physical activity, which contributes to total energy expended, includes both occupational (work-related) and non-occupational or leisure time activity (Church, et al., 2011). Work-related physical activity has a crucial impact on the total caloric expenditure of the human body. During the last 50 years, the average daily energy expenditure related to physical activity at work has decreased by 100 calories or more per day (Church, et al., 2011). The decrease in occupational physical activity has been caused by the reduction of employment in the more physically active goods-producing sector and growth in the less active service-related sector (Church, et al., 2011). Jobs with moderate or intensive physical activity have decreased from 50% to 20% over the

last five decades (Church, et al., 2011). Recent technological development (i.e., growth in computer use) has further increased the sedentary nature of many jobs.

The US Census Bureau has grouped occupations into low occupational activity and high occupational activity jobs (King, et al., 2001). People in low occupational activity occupations include executives, administrators and managers, other workers in management-related occupations, engineers and scientists, teachers, secretaries, stenographers and typists, information clerks, motor vehicle operators, scheduling and distributing clerks, and individuals in records processing occupations, material recording, and miscellaneous administrative support occupations (King, et al., 2001). High occupational activity occupations include waiters and waitresses, cleaning and building service workers, farms and nursery workers, construction tradespeople, construction laborers, and other laborers except construction, freight, stock and material movers (King, et al., 2001).

Federal physical activity recommendations from 2008 call for 150 minutes per week of moderate leisure activity or 75 minutes of vigorous activity (Church, et al., 2011). This level of activity should compensate for the decrease in caloric expenditure related to decreased occupational physical activity (Church, et al., 2011). Unfortunately, only one out of four Americans adheres to these recommendations. Reduction in the daily occupation-related energy expenditure has been linked to an increase in the average body weight of both men and women among the U.S. population (Church, et al., 2011).

Productivity or absenteeism due to sickness does not appear to have any clear association to physical activity (Bernard, and Hildebrandt, 2007); however, obese male workers had lower productivity when compared with lean and overweight workers.

Increased total physical activity was linked to low sick leaves (Proper, 2005). A study conducted from Dutch databases using continuous and cross sectional surveys found that a high intensity of physical activity decreases the amount of sick leave taken by workers (Proper et al., 2005).

Through the years the rate of occupations of a more sedentary nature has increased (Caban-Martinez, et al., 2007). The development of more advanced and sophisticated technological tools has contributed to this tendency because it has decreased the level of physical effort and increased the mental or psychological effort needed in the workplace. Network systems and data communications analysts and computer software engineers are a few of the occupations with the fastest growth, according to the CDC (2009). Also, some jobs require excessive static standing, which could possibly increase fatigue and thus could consequently reduce leisure activity in the workplace.

### ***Productivity***

Obesity can affect the performance and productivity of an individual in the workplace (Schulte, et al., 2007). When compared to lean employees, obese employees have lower absolute productivity (Bernaards and Hildebrandt, 2007) and are more likely to have health issues which increase the risk of absenteeism due to sickness (Schulte, et al., 2007). Obesity has been found to be a contributing factor to increased absenteeism in the workplace (Schulte, et al., 2007). Obese employees make more use of sick leave and disability benefits (Schmier, Jones, and Halpern, 2006).

Shulte et al. (2008) have reported that obese workers are 1.7 times more likely to have a high level of absenteeism (seven or more absences within six months) or moderate absenteeism (three to six absences within a six-month period).

Furthermore, they affirmed that performance issues generated by obesity eventually have financial consequences for the employer, including higher healthcare insurance contributions and medical leave payments (paid sick days). The cost of healthcare expenses was 40.2% higher for obese women and 47.7% for obese men than other employees (Sturm, 2004). The increase in healthcare costs occurs as a result of the chronic conditions (such as diabetes) associated with obesity, which increases the frequency of healthcare services utilization (Sturm, Ringel, and Andreyeva, 2004).

### ***Occupational Hazards***

Obesity may be related to unpleasant work conditions (Schulte and Miller, 2007). Workplaces can include a variety of occupational hazards related to the physical environment (equipment and tools), chemical use and environmental (temperature) issues. Occupational hazards may create an unpleasant environment, creating a stressful situation and potentially leading to occupational injury and illness (Schulte, and Miller, 2007). An obese worker might have a higher risk of experiencing vibration-induced injury and occupational musculoskeletal disorders (Schulte, et al., 2007). Obesity may increase the risk of developing a particular disease or injury related to workplace hazards (Schulte, et al., 2007). Obesity may negatively affect work opportunity and the relationship between workplace exposure and health outcome (Schulte and Miller, 2008).

### ***Socio-economic level***

Socio-economic differences are inversely related to obesity (Sarlio-Lahteenkorva, Lissau and Lahelma, 2005). Although obesity prevalence has increased among Americans regardless of their income and education level from 1988 to 2008, studies have shown a connection between obesity and socioeconomic status (Ogden and Flegal, 2010). Obese individuals are more likely to experience long-term unemployment and lower wages than comparable individuals with normal weight (Sarlio-Lahteenkorva and Lahelma, 2005)

### ***Obesity effects***

Obesity affects the overall mortality rate and the development of chronic and severe diseases. An obese person has a higher mortality risk and uses health services with more frequency than people of normal weight (Ostbye, Dement and Krause, 2007). There is a direct relationship between BMI and the number of insurance claims, including workers' compensation, and loss of work days (Ostbye, et al., 2007). Individuals with extreme obesity have double the chance of experiencing fair or poor health, along with having several and more specific medical conditions when compared with normal weight individuals (Sturm, Ringel and Andreyeva, 2004). The probability of executing daily activities without limitations decreases by 50 percent among males with moderate obesity and by 300 percent among males with severe obesity (Sturm, Ringel and Andreyeva, 2004). Additionally, the probability of developing limitations to activities of daily living is even higher among females; moderate obesity doubles this risk and severe obesity quadruples the risk of developing limitations of daily activities (Sturm, Ringel and Andreyeva, 2004). These health issues ultimately increase the expense of healthcare and



the risk for more sick leave or disability usage (Schmier and Halpen, 2006). A study by William et al. (2007) found that 5.7% of the United States' national expenditures was directly related to obesity in 1995. This percentage increased to 9.1% in 1998, with a trend of continued growth (William, et al., 2007). Health care costs may be as much as 44% higher for obese individuals than they are for normal weight individuals (Sturm et al., 2004). The effects of obesity on the cost of employer-provided benefits could help to motivate employers to introduce interventions and prevention programs at the workplace in an effort to reduce the prevalence of obesity among their employees (Schmier, et al., 2006).

### ***Hypothesis***

The continuous increase of obesity prevalence among the United States population has captured researchers' interest in investigating the contributing factors. Another objective for research studies is to present possible interventions that could help to control this crisis and prevent and reduce obesity among the American population.

This study aims to establish a relationship between obesity and occupational characteristics. Could certain occupational tasks or characteristics increase or decrease the risk for obesity? The study will attempt to identify the factors that make an occupation more vulnerable to obesity and to determine which jobs have a higher risk for obesity.

Technology is constantly improving and becoming more automated to improve consistency and decrease labor costs (Caban, et al., 2005). These new technologies may be decreasing the physical activity needed to perform specific tasks, which may in turn increase the risk of developing obesity among workers. Another possibility is that the

characteristics and demands of certain jobs contribute to increased stress levels, which may also lead to obesity.

## Methodology

This exploratory cross sectional study uses public data sets available through the Occupation Information Network (O\*NET), the National Health Interview Survey (NHIS) and the United States Department of Labor. Obesity prevalence among the 41 occupational groups was previously gathered from the NHIS by Caban, et al. (2005). Employment information for each of the approximately 800 occupations included in this study was obtained from “*Occupational Employment Statistics*” found on the Department of Labor website (Bureau of Labor Statistics, 2012). Data for approximately 220 occupational characteristics and tasks was obtained from the granular O\*NET Resource Center (2008).

The NHIS data was collected through self-reported surveys from individuals aged 18 years and older that affirmed they were working for at least two weeks prior to the survey (Caban, et al., 2005). The NHIS represents a continuous, multipurpose and multistage probability survey of the American civilian non-institutionalized population (Caban, et al., 2005). The O\*NET is a major source for national occupational data available for the general public (Hadden, Kravets, and Muntaner, 2004). Under the sponsorship of the U.S. Department of Labor/Employment and Training Administration (USDOL/ETA), the O\*NET (2013) groups occupations using the Standard Occupational Classification System (SOC). Occupation analysts collected the necessary data to classify the occupations according to their occupational definition including job performed, skills, education, training and credentials (ONET, 2013). Through the use of the O\*NET CODES, over 809 occupations were classified in 41 job families or clusters according to their job description.

The Occupational Employment Statistics (OES) program of the United States Department of Labor generates estimates about annual employment and wages for over 800 occupations. The statistical data available provides average information for the entire U.S., although the data have also been used to estimate averages for individual States and metropolitan/non-metropolitan areas. This study uses the national averages. Estimates about occupational data are also available for specific industries (Bureau of Labor Statistics, 2012).

This study will identify the occupational clusters with the highest obesity prevalence and the specific occupations included in those occupational clusters. In addition, some ideas for intervention strategies for employees and employers will be suggested with the purpose of slowing down or reversing the increase of obesity in American society.

“Job effort” was constructed by using 224 different job characteristics or tasks as variables. (The occupational tasks included in the study are presented in the results section.) Depending on the effort needed to complete the task, job characteristics were scored from 1 to 5; 5 representing the highest level of effort needed to complete the task. The 224 variables were subjected to exploratory factor analyses (Hadden, Kravets, and Muntaner, 2004) to determine clusters of similar variables. The factor analysis performed by Hadden, et al. (2004) resulted in three primary factors: physical demands, substantive complexity (complexity of the job or “job control”) and working with people vs. things (objects).

Data was analyzed by performing partial correlation analysis using the SPSS (Statistical Product and Service Solutions) statistical program, where the occupational

characteristics and/ or tasks were independent variables and obesity prevalence by occupational group (for men, women, and combined) were the dependent variables. The average wage by occupational group was subsequently added as a confounding variable. Statistical significance ( $p$  value) was established at 0.10 to assure the study captures as many positive associations as possible and to minimize Type 2 (false negative) error in this exploratory study.

## Results

Table 3 presents the overall obesity prevalence for the 41 occupational groups, as well as the estimated average hourly wage and the estimated number of employees in each occupational group. Table 4 and Figure 5 show the obesity prevalence by gender. The estimated percentage of men and women that are employed for each of the occupational groups, the mean hourly wage as well as the estimated U.S population for each of the occupational groups are also included on Table 4. (Tables A1 through A41 in the appendix show the estimated employment for each of the individual occupations included in each of the 41 occupational groups.) Over 800 occupations were classified into the 41 occupational groups based on the job description provided by O\*NET.

**Table 3: The 41 Occupational groups with overall obesity prevalence, mean hourly wage and estimated U.S. population.**

41 Occupational Groups	Overall Obesity Prevalence	Mean Hourly Wage	Estimated U.S. Population
01 = Officials and administrators public admin	24.70	\$ 36.29	570,280
02 = Managers administrators, except public administration	20.66	\$ 47.89	5,187,720
03 = Management related occupations	18.35	\$ 29.62	1,438,450
04 = Engineers	17.64	\$ 44.53	1,356,390
05 = Architects and surveyors	13.24	\$ 31.81	152,610
06 = Natural mathematical/computer scientists	17.19	\$ 40.12	3,299,810
07 = Health diagnosing occupations	10.93	\$ 73.62	527,830
08 = Health assessment/treating occupations	20.14	\$ 37.83	3,758,350
09 = Teachers, librarians, counselors	17.96	\$ 33.29	7,258,280
10 = Writers, artists, entertainers, athletes	15.26	\$ 25.25	1,639,070
11 = Other professional specialty occupations	19.95	\$ 34.63	1,406,180
12 = Health technologists/technicians	21.50	\$ 20.91	2,067,430
13 = Technologists, technicians except health	21.72	\$ 24.03	917,800
14 = Supervisors and proprietors	21.08	\$ 25.55	6,054,570
15 = Sales representatives, commodities and finance	17.07	\$ 28.03	8,240,750

16 = Other sales	18.41	\$ 15.44	1,846,630
17 = Computer equipment operators	24.29	\$ 38.70	177,630
18 = Secretaries, stenographers and typists	19.59	\$ 20.16	7,560,740
19 = Financial records processing occupations	20.72	\$ 28.35	5,243,560
20 = Mail and message distributing	19.17	\$ 20.78	643,760
21 = Other administrative support	22.57	\$ 15.13	5,713,950
22 = Private household occupations	19.37	\$ 13.35	1,296,900
23 = Police and firefighters	28.03	\$ 24.78	1,480,380
24 = Other protective service occupations	28.30	\$ 26.65	2,361,480
25 = Food service	19.44	\$ 12.84	10,744,380
26 = Health service	31.60	\$ 27.84	4,066,280
27 = Cleaning and building service	24.01	\$ 14.56	3,341,600
28 = Personal service	21.19	\$ 14.82	3,620,740
29 = Farm operators and managers	21.09	\$ 21.20	19,260
30 = Farm workers and other agricultural workers	19.46	\$ 14.28	353,450
31 = Forestry and fishing occupations	19.39	\$ 21.02	249,730
32 = Mechanics and repairers	22.84	\$ 20.26	4,211,430
33 = Construction and extractive trades	18.13	\$ 21.14	51,120
34 = Precision production occupations	24.58	\$ 16.19	1,737,850
35 = Machine operators/tenderers, except precision	23.97	\$ 19.43	3,730,930
36 = Fabricators, assemblers, inspectors, samplers	23.20	\$ 18.38	2,181,180
37 = Motor vehicle operators	31.58	\$ 18.52	3,676,800
*38 = Other transportation, except motor vehicles	29.21	\$ 28.75	204,410
39 = Material moving equipment operators	28.32	\$ 19.16	658,760
40 = Construction laborers	22.29	\$ 19.00	3,634,178
41 = Freight, stock, material handlers	21.37	\$ 14.30	5,864,960

\* Interpret results with caution due to small sample size

**Table 4: The 41 Occupational groups with obesity prevalence by gender, hourly wage and estimated gender distribution.**

41 Occupational Groups	Men Obesity Prevalence	Women Obesity Prevalence	Mean Hourly Wage	Men Population (%)	Women Population (%)	U.S. Population
01 = Officials and administrators, public admin	27.79	21.12	\$ 36.29	53.69%	46.31%	570,280
02 = Managers administrators,	22.34	18.11	\$ 47.89	60.40%	39.60%	5,187,720

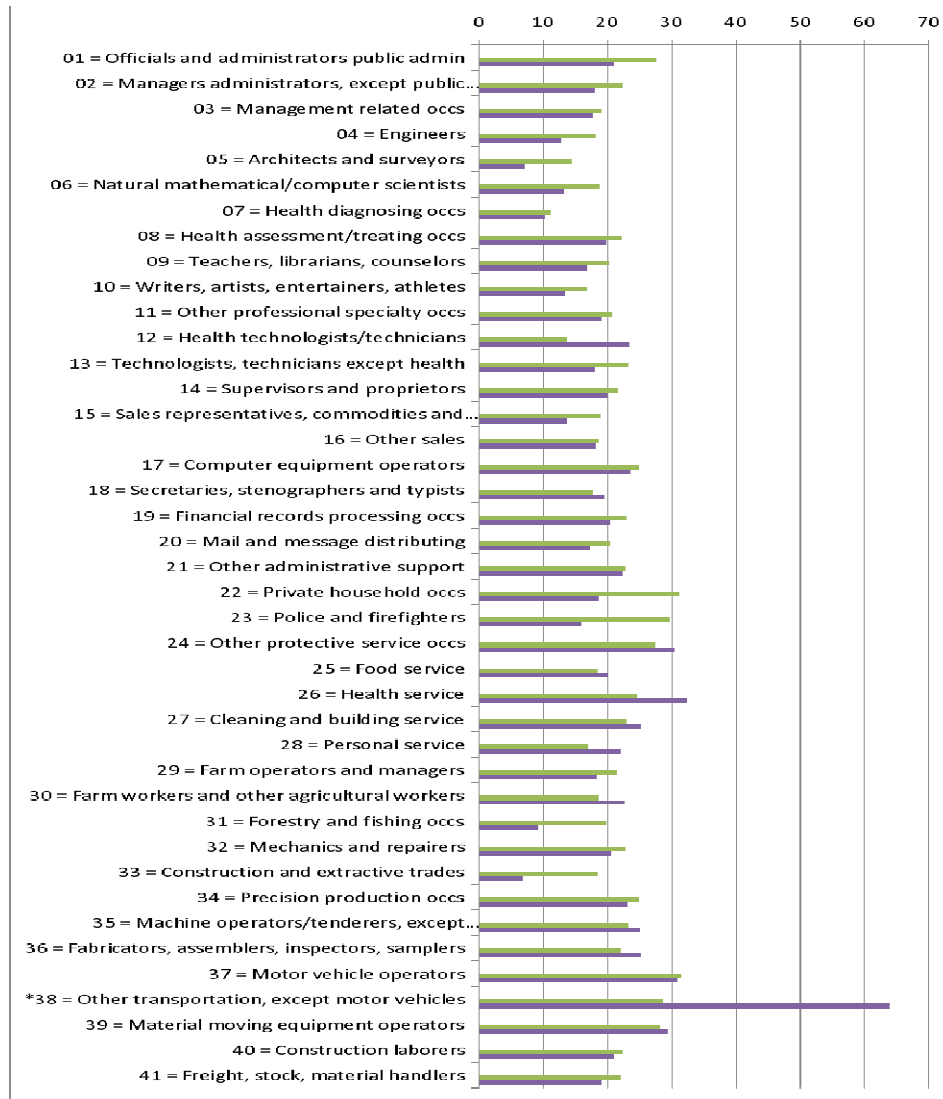
except public administration						
03 = Management related Occupations	19.12	17.78	\$ 29.62	42.19%	57.81%	1,438,450
04 = Engineers	18.18	12.84	\$ 44.53	89.83%	10.17%	1,356,390
05 = Architects and surveyors	14.54	7.29	\$ 31.81	82.11%	17.89%	152,610
06 = Natural mathematical /computer scientists	18.85	13.3	\$ 40.12	70.01%	29.99%	3,299,810
07 = Health diagnosing occupations	11.19	10.25	\$ 73.62	72.12%	27.88%	527,830
08 = Health assessment/treating Occupations	22.20	19.83	\$ 37.83	13.02%	86.98%	3,758,350
09 = Teachers, librarians, Counselors	20.37	16.84	\$ 33.29	31.65%	68.35%	7,258,280
10 = Writers, artists, entertainers, Athletes	16.88	13.48	\$ 25.25	52.40%	47.60%	1,639,070
11 = Other professional specialty Occupations	20.72	19.14	\$ 34.63	51.14%	48.86%	1,406,180
12 = Health technologists/ Technicians	13.67	23.48	\$ 20.91	20.21%	79.79%	2,067,430
13 = Technologists and technicians, except health	23.29	18.04	\$ 24.03	70.11%	29.89%	917,800
14 = Supervisors and proprietors	21.79	19.96	\$ 25.55	61.08%	38.92%	6,054,570
15 = Sales representatives, commodities and finance	19.02	13.68	\$ 28.03	63.41%	36.59%	8,240,750
16 = Other sales	18.67	18.24	\$ 15.44	38.64%	61.36%	1,846,630
17 = Computer equipment Operators	24.94	23.76	\$ 38.70	44.61%	55.39%	177,630
18 = Secretaries, stenographers and typists	17.65	19.63	\$ 20.16	2.27%	97.73%	7,560,740
19 = Financial records processing occupations	23.10	20.42	\$ 28.35	11.07%	88.93%	5,243,560
20 = Mail and message Distributing	20.45	17.39	\$ 20.78	58.33%	41.67%	643,760
21 = Other administrative Support	22.88	22.46	\$ 15.13	27.27%	72.73%	5,713,950
22 = Private household occupations	31.32	18.76	\$ 13.35	4.85%	95.15%	1,296,900
23 = Police and firefighters	29.79	15.89	\$ 24.78	86.75%	13.75%	1,480,380
24 = Other protective service occupations	27.58	30.45	\$ 26.65	74.96%	25.04%	2,361,480
25 = Food service	18.49	20.10	\$ 12.84	40.69%	59.31%	10,744,380
26 = Health service	24.61	32.43	\$ 27.84	10.56%	89.44%	4,066,280
27 = Cleaning and building service	22.99	25.25	\$ 14.56	54.88%	45.12%	3,341,600
28 = Personal service	17.14	22.01	\$ 14.82	16.78%	83.22%	3,620,740
29 = Farm operators and managers	21.62	18.35	\$ 21.20	83.79%	16.21%	19,260



30 = Farm workers and other agricultural workers	18.72	22.76	\$ 14.28	81.69%	18.31%	353,450
31 = Forestry and fishing occupations	19.81	9.32	\$ 21.02	96.02%	3.98%	249,730
32 = Mechanics and repairers	22.94	20.65	\$ 20.26	95.51%	4.49%	4,211,430
33 = Construction and extractive trades	18.45	6.93	\$ 21.14	97.26%	2.74%	51,120
34 = Precision production occupations	25.00	23.20	\$ 16.19	76.70%	23.30%	1,737,850
35 = Machine operators/tenderers, except precision	23.37	25.14	\$ 19.43	66.30%	33.70%	3,730,930
36 = Fabricators, assemblers, inspectors, samplers	22.00	25.30	\$ 18.38	63.54%	36.46%	2,181,180
37 = Motor vehicle operators	31.66	31.02	\$ 18.52	87.88%	12.12%	3,676,800
*38 = Other transportation, except motor vehicles	28.72	64.08	\$ 28.75	98.61%	1.39%	204,410
39 = Material moving equipment operators	28.24	29.53	\$ 19.16	93.44%	6.56%	658,760
40 = Construction laborers	22.32	21.09	\$ 19.00	97.92%	2.08%	3,634,178
41 = Freight, stock, material handlers	22.09	19.12	\$ 14.30	75.66%	24.34%	5,864,960

\* Interpret results with caution due to small sample size

**Figure 5: Obesity prevalence for 41 occupational groups, by Gender**



\* Interpret results with caution due to small sample size

Tables 5 and 6 show the 41 occupational groups organized from lowest to highest obesity prevalence for men and women respectively. When looking at the five groups with the highest and lowest obesity prevalence, there are similarities between genders. Among the occupational groups with lower obesity prevalence for both men and women were architects and surveyors (group 5) and health diagnostic (group 7). Motor vehicle operators (group 37), other transportation except motor vehicle (group 38) and material

moving equipment operators (group 39) were among the five occupational groups with the highest obesity prevalence for both genders. It is important to mention that the elevated obesity prevalence among women for occupational group 38 (Other transportation, except motor vehicles) may be unreliable due to the low number of women working in the occupational group (1.39% of a total of 204,410 employees). Obesity prevalence among women has a wide range, from 6.93% for the small (and therefore relatively unreliable) group 33 (Construction and extractive trades) up to 64.08% for group 38 (Other transportation, except motor vehicles). Male obesity prevalence ranges from 11.19% in group 7 (Health diagnosing occupations) up to 31.66% in group 37 (Motor vehicle operators).

**Table 5: Occupational groups sorted by obesity prevalence, Males**

Occupational Groups	Male obesity Prevalence	Estimated hourly wage
07 = Health diagnosing occupations	11.19	\$ 73.62
12 = Health technologists/technicians	13.67	\$ 20.91
05 = Architects and surveyors	14.54	\$ 31.81
10 = Writers, artists, entertainers, athletes	16.88	\$ 25.25
28 = Personal service	17.14	\$ 14.82
18 = Secretaries, stenographers and typists	17.65	\$ 20.16
04 = Engineers	18.18	\$ 44.53
33 = Construction and extractive trades	18.45	\$ 21.14
25 = Food service	18.49	\$ 12.84
16 = Other sales	18.67	\$ 15.44
30 = Farm workers and other agricultural workers	18.72	\$ 14.28
06 = Natural mathematical/computer scientists	18.85	\$ 40.12
15 = Sales representatives, commodities and finance	19.02	\$ 28.03
03 = Management related occupations	19.12	\$ 29.62

31 = Forestry and fishing occupations	19.81	\$ 21.02
09 = Teachers, librarians, counselors	20.37	\$ 33.29
20 = Mail and message distributing	20.45	\$ 20.78
11 = Other professional specialty occupations	20.72	\$ 34.63
29 = Farm operators and managers	21.62	\$ 21.20
14 = Supervisors and proprietors	21.79	\$ 25.55
36 = Fabricators, assemblers, inspectors, samplers	22.00	\$ 18.38
41 = Freight, stock, material handlers	22.09	\$ 14.30
08 = Health assessment/treating occupations	22.20	\$ 37.83
40 = Construction laborers	22.32	\$ 19.00
02 = Managers administrators, except public administration	22.34	\$ 47.89
21 = Other administrative support	22.88	\$ 15.13
32 = Mechanics and repairers	22.94	\$ 20.26
27 = Cleaning and building service	22.99	\$ 14.56
19 = Financial records processing occupations	23.10	\$ 28.35
13 = Technologists, technicians except health	23.29	\$ 24.03
35 = Machine operators/tenderers, except precision	23.37	\$ 19.43
26 = Health service	24.61	\$ 27.84
17 = Computer equipment operators	24.94	\$ 38.70
34 = Precision production occupations	25.00	\$ 16.19
24 = Other protective service occupations	27.58	\$ 26.65
01 = Officials and administrators public admin	27.79	\$ 36.29
39 = Material moving equipment operators	28.24	\$ 19.16
*38 = Other transportation, except motor vehicles	28.72	\$ 28.75
23 = Police and firefighters	29.79	\$ 24.78
22 = Private household occupations	31.32	\$ 13.35
37 = Motor vehicle operators	31.66	\$ 18.52

\* Interpret results with caution due to small sample size

**Table 6: Occupational groups sorted by obesity prevalence, Females**

Occupational Groups	Female obesity Prevalence	Estimated hourly wage
33 = Construction and extractive trades	6.93	21.14
05 = Architects and surveyors	7.29	31.81
31 = Forestry and fishing occupations	9.32	21.02
07 = Health diagnosing occupations	10.25	73.62
04 = Engineers	12.84	44.53
06 = Natural mathematical/computer scientists	13.3	40.12
10 = Writers, artists, entertainers, athletes	13.48	25.25
15 = Sales representatives, commodities and finance	13.68	28.03
23 = Police and firefighters	15.89	24.78
09 = Teachers, librarians, counselors	16.84	33.29
20 = Mail and message distributing	17.39	20.78
03 = Management related occupations	17.78	29.62
13 = Technologists, technicians except health	18.04	24.03
02 = Managers administrators, except public administration	18.11	47.89
16 = Other sales	18.24	15.44
29 = Farm operators and managers	18.35	21.20
22 = Private household occupations	18.76	13.35
41 = Freight, stock, material handlers	19.12	14.30
11 = Other professional specialty occupations	19.14	34.63
18 = Secretaries, stenographers and typists	19.63	20.16
08 = Health assessment/treating occupations	19.83	37.83
14 = Supervisors and proprietors	19.96	25.55
25 = Food service	20.10	12.84
19 = Financial records processing occupations	20.42	28.35
32 = Mechanics and repairers	20.65	20.26
40 = Construction laborers	21.09	19.00
01 = Officials and administrators public admin	21.12	36.29

28 = Personal service	22.01	14.82
21 = Other administrative support	22.46	15.13
30 = Farm workers and other agricultural workers	22.76	14.28
34 = Precision production occupations	23.20	16.19
12 = Health technologists/technicians	23.48	20.91
17 = Computer equipment operators	23.76	38.70
35 = Machine operators/tenderers, except precision	25.14	19.43
27 = Cleaning and building service	25.25	14.56
36 = Fabricators, assemblers, inspectors, samplers	25.30	18.38
39 = Material moving equipment operators	29.53	19.16
24 = Other protective service occupations	30.45	26.65
37 = Motor vehicle operators	31.02	18.52
26 = Health service	32.43	27.84
*38 = Other transportation, except motor vehicles	64.08	28.75

\* Interpret results with caution due to small sample size

The estimated average hourly wage has been included as a potentially confounding variable along with the overall obesity prevalence. The average wage for the five groups with the highest obesity prevalence (\$20.91 for men and \$24.98 for women) was over one-third lower than the average wage for the occupational groups with the lowest obesity prevalence (\$33.28 for men and \$38.42 for women) for both genders. One interesting note is that the group with the highest estimated hourly wage was among the five occupational groups with the lower obesity prevalence. However, the occupational groups with the highest obesity prevalence did not have the lowest estimated hourly wage. See Tables 7 and 8 for more details.

As shown in Tables 7 and 8, some of the groups with the highest obesity prevalence had high prevalence for both genders; examples include Motor vehicle

operator (group 37) and material moving equipment operators (group 39). The obesity prevalence for “other transportation, except motor vehicle” (group 38), should be analyzed with caution due to the small sample size.

The five lowest obesity occupations average higher wages than the five highest obesity occupations (Tables 7 and 8). These findings are consistent for both genders (Tables 7 and 8).

**Table 7: Occupational groups with the 5 lowest and 5 highest obesity prevalence for men**

Occupational Groups	Men obesity Prevalence	Estimated hourly wage
	<b>Lowest</b>	<b>Mean wage = \$ 33.28</b>
07 = Health diagnosing occupations	11.19	\$ 73.62
12 = Health technologists/technicians	13.67	\$ 20.91
05 = Architects and surveyors	14.54	\$ 31.81
10 = Writers, artists, entertainers, athletes	16.88	\$ 25.25
28 = Personal service	17.14	\$ 14.82
	<b>Highest</b>	<b>Mean wage = \$ 20.91</b>
39 = Material moving equipment operators	28.24	\$ 19.16
*38 = Other transportation, except motor vehicles	28.72	\$ 28.75
23 = Police and firefighters	29.79	\$ 24.78
22 = Private household occupations	31.32	\$ 13.35
37 = Motor vehicle operators	31.66	\$ 18.52

\* Interpret results with caution due to small sample size

**Table 8: Occupational groups with the 5 lowest and 5 highest obesity prevalence for women**

Occupational Groups	Women obesity Prevalence	Estimated hourly wage
	<b>Lowest</b>	<b>Mean wage = \$ 38.42</b>
33 = Construction and extractive trades	6.93	\$ 21.14
05 = Architects and surveyors	7.29	\$ 31.81
31 = Forestry and fishing occupations	9.32	\$ 21.02
07 = Health diagnosing occupations	10.25	\$ 73.62
04 = Engineers	12.84	\$ 44.53
	<b>Highest</b>	<b>Mean wage = \$ 24.18</b>
39 = Material moving equipment operators	29.53	\$ 19.16
24 = Other protective service occupations	30.45	\$ 26.65
37 = Motor vehicle operators	31.02	\$ 18.52
26 = Health service	32.43	\$ 27.84
*38 = Other transportation, except motor vehicles	64.08	\$ 28.75

\* Interpret results with caution due to small sample size

Table 9 displays all 224 occupational tasks and characteristics as well as the strength of association between each task or characteristic and the overall obesity prevalence for males and females, while Table 10 shows only the associations that were significant at the 0.10 significance level). Estimated mean hourly wage was entered into the models to determine if social class could have an effect on the association between the occupational task and obesity prevalence. The overall correlation between percent of obesity by occupation and mean hourly wage was -0.203 ( $p = 0.203$ ) for women and -0.283 ( $p = 0.073$ ) for men.



**Table 9: Correlation results between occupational tasks and obesity prevalence for 41 occupational groups**

	Women		Women with wage		Men		Men with wage	
Occupational Task	Correlation Coefficient	p-value	Correlation Coefficient	p-value	Correlation Coefficient	p-value	Correlation Coefficient	p-value
Contact with others	0.048	0.765	0.134	0.410	-0.038	0.815	0.073	0.654
Consequence of error	0.217	0.174	<b>0.335</b>	<b>0.035</b>	0.023	0.885	0.158	0.329
Coordinate or lead others	-0.102	0.527	-0.011	0.945	-0.090	0.574	0.044	0.789
Deal with external customer	-0.039	0.808	0.041	0.800	-0.022	0.890	0.095	0.560
Deal with physically aggressive people	0.085	0.598	0.137	0.398	0.247	0.119	<b>0.333</b>	<b>0.036</b>
Deal with unpleasant and angry people	0.081	0.616	0.095	0.559	0.103	0.521	0.126	0.440
Degree of automation	-0.070	0.662	-0.068	0.677	-0.039	0.808	-0.035	0.829
Electronic Mail	<b>-0.341</b>	<b>0.029</b>	<b>-0.280</b>	<b>0.081</b>	-0.258	0.104	-0.125	0.443
Expose to contaminants	<b>0.313</b>	<b>0.046</b>	<b>0.268</b>	<b>0.095</b>	<b>0.308</b>	<b>0.050</b>	0.240	0.135
Expose to diseases or infections	0.027	0.868	0.092	0.574	-0.072	0.656	0.012	0.943
Expose to hazardous conditions	0.195	0.222	0.163	0.314	0.129	0.423	0.081	0.620
Hazardous equipment	0.163	0.310	0.108	0.505	0.143	0.371	0.063	0.698
Expose to high places	<b>0.277</b>	<b>0.080</b>	0.237	0.140	0.205	0.198	0.143	0.377
Expose to minor burns cuts	0.081	0.616	-0.013	0.936	0.021	0.899	-0.126	0.438
Expose to radiation	0.020	0.903	0.154	0.342	<b>-0.370</b>	<b>0.017</b>	<b>-0.270</b>	<b>0.092</b>
Expose to whole body vibration	0.246	0.120	0.204	0.206	0.187	0.242	0.122	0.454
Extremely bright or inadequate lighting	0.213	0.180	0.160	0.324	0.164	0.306	0.081	0.620
Face to face discussion	-0.091	0.570	-0.079	0.629	-0.188	0.240	-0.175	0.280
Freedom to make decisions	-0.119	0.460	0.022	0.892	0.005	0.973	<b>0.269</b>	<b>0.093</b>
Cramped work space / Awkward positions	0.190	0.234	0.169	0.297	0.155	0.334	0.125	0.443
Frequency of conflict situations	-0.034	0.835	-0.002	0.992	0.086	0.593	0.138	0.396
Frequency of decision making	-0.088	0.584	-0.017	0.916	0.017	0.916	0.131	0.419
Impact of decision on coworkers/ company results	-0.068	0.673	0.030	0.853	-0.004	0.981	0.150	0.355
Importance of being exact or accurate	-0.090	0.576	-0.036	0.828	-0.100	0.501	-0.032	0.845
Importance of repeating same tasks	0.061	0.703	0.056	0.730	0.071	0.661	0.065	0.692
In an enclosed vehicle or	0.124	0.439	0.104	0.524	<b>0.308</b>	<b>0.050</b>	<b>0.289</b>	<b>0.070</b>

equipment								
In an open vehicle or equipment	0.223	0.161	0.170	0.295	<b>0.279</b>	<b>0.077</b>	0.207	0.200
In doors environmentally controlled	-0.255	0.108	-0.209	0.196	<b>-0.261</b>	<b>0.099</b>	-0.195	0.228
In doors not environmentally controlled	0.182	0.254	0.140	0.388	<b>0.340</b>	<b>0.029</b>	<b>0.292</b>	<b>0.067</b>
Letters and memos	<b>-0.292</b>	<b>0.064</b>	-0.224	0.165	-0.258	0.103	-0.140	0.389
Level of competition	-0.248	0.118	-0.181	0.263	-0.091	0.571	0.037	0.821
Outdoors exposed to weather	0.212	0.183	0.163	0.316	<b>0.347</b>	<b>0.026</b>	<b>0.287</b>	<b>0.073</b>
Outdoors under cover	0.141	0.380	0.091	0.578	<b>0.277</b>	<b>0.079</b>	0.217	0.179
Pace determine by speed of equipment	0.220	0.166	0.147	0.366	0.176	0.270	0.056	0.732
Physical proximity	0.014	0.932	0.014	0.932	-0.135	0.401	-0.140	0.387
Public speaking	<b>-0.264</b>	<b>0.096</b>	-0.195	0.229	-0.011	0.948	0.144	0.374
Responsibility for outcomes and results	-0.097	0.545	-0.042	0.796	0.099	0.538	0.195	0.227
Responsibility for others health and safety	0.192	0.229	0.198	0.220	<b>0.371</b>	<b>0.017</b>	<b>0.390</b>	<b>0.013</b>
Sounds / noise levels are distracting or uncomfortable	0.220	0.166	0.166	0.305	0.255	0.108	0.179	0.269
Spend time bending or twisting the body	0.177	0.270	0.087	0.592	0.218	0.171	0.091	0.577
Spend time climbing ladders, scaffolds or poles	<b>0.260</b>	<b>0.100</b>	0.215	0.184	0.258	0.103	0.191	0.238
Spend time keeping or regaining balance	0.206	0.197	0.125	0.443	0.238	0.134	0.119	0.463
Spend time kneeling, crouching, stooping or crawling	0.042	0.793	0.082	0.616	0.132	0.410	-0.026	0.876
Spend time making repetitive motions	0.087	0.591	-0.057	0.725	0.113	0.481	-0.092	0.573
Spend time sitting	-0.045	0.779	0.027	0.866	0.016	0.921	0.127	0.435
Spend time standing	0.031	0.847	-0.052	0.750	0.030	0.854	-0.089	0.583
Spending time using your hands to handle control	0.205	0.199	0.127	0.434	0.115	0.474	-0.019	0.905
Spending time walking and running	0.086	0.592	-0.018	0.911	0.190	0.234	0.058	0.720
Structured versus unstructured work	-0.219	0.170	-0.177	0.275	-0.404	0.404	-0.068	0.677
Telephone	-0.175	0.274	-0.096	0.556	-0.162	0.311	<b>-0.041</b>	<b>0.800</b>
Time pressure	0.115	0.475	0.168	0.300	<b>0.288</b>	<b>0.068</b>	<b>0.375</b>	<b>0.017</b>
Very hot or very cold temperature	0.259	0.102	0.203	0.208	<b>0.386</b>	<b>0.013</b>	<b>0.317</b>	<b>0.046</b>
Wear common protective or safe equipment	0.219	0.170	0.183	0.259	0.172	0.282	0.119	0.466

Wear specialized protective or safety equipment	0.041	0.798	0.032	0.846	0.012	0.940	-0.002	0.990
Work with work group or team	-0.071	0.657	-0.055	0.737	-0.059	0.714	-0.036	0.827
Getting information	-0.062	0.702	0.036	0.826	0.021	0.898	0.176	0.278
Monitor process materials or surroundings	0.156	0.329	0.226	0.161	<b>0.273</b>	<b>0.084</b>	<b>0.381</b>	<b>0.015</b>
Identifying objects actions and events	0.032	0.842	0.092	0.574	0.097	0.546	0.187	0.249
Inspecting equipment, structures or material	0.247	0.120	0.215	0.183	<b>0.302</b>	<b>0.055</b>	0.262	0.103
Estimating the quantifiable characteristics of products events	-0.066	0.683	-0.023	0.890	-0.006	0.969	0.059	0.718
Judging the qualities of things services or people	-0.188	0.240	-0.129	0.429	0.057	0.723	0.171	0.292
Processing information	-0.153	0.341	-0.065	0.689	-0.115	0.475	0.023	0.888
Evaluating information to determine compliance with standards	-0.050	0.758	0.039	0.810	0.061	0.707	0.204	0.206
Analyzing data or information	-0.245	0.123	-0.146	0.368	-0.131	0.414	0.102	0.530
Making decisions and solving problems	-0.190	0.234	-0.088	0.588	-0.085	0.595	0.107	0.511
Thinking creatively	<b>-0.292</b>	<b>0.064</b>	-0.224	0.165	-0.156	0.329	-0.014	0.933
Updating and using relevant knowledge	<b>-0.274</b>	<b>0.083</b>	-0.192	0.235	-0.249	0.116	-0.096	0.577
Developing objectives and strategies	-0.257	0.105	-0.175	0.281	-0.004	0.978	0.203	0.210
Scheduling work and activities	<b>-0.305</b>	<b>0.052</b>	-0.242	0.133	-0.053	0.741	0.099	0.545
Organizing , planning and prioritizing work	<b>-0.292</b>	<b>0.064</b>	-0.232	0.149	-0.170	0.289	-0.057	0.729
Performing general physical activities	0.193	0.226	0.124	0.448	<b>0.308</b>	<b>0.050</b>	0.220	0.172
Handling and moving objects	0.190	0.234	0.102	0.531	0.187	0.242	0.051	0.757
Controlling machines and processes	0.228	0.152	0.177	0.275	0.152	0.343	0.070	0.667
Operating vehicles and mechanized devices or equipment	0.225	0.157	0.171	0.292	<b>0.377</b>	<b>0.015</b>	0.313	0.049
Interacting with computers	<b>-0.330</b>	<b>0.035</b>	<b>-0.282</b>	<b>0.078</b>	-0.254	0.108	-0.172	0.288
Drafting / laying outland specific technical devices parts	-0.195	0.221	-0.169	0.298	-0.073	0.649	-0.030	0.855
Repairing and maintaining mechanical equipment	0.099	0.539	0.037	0.822	0.153	0.340	0.069	0.672
Repairing and maintaining electronic equipment	-0.081	0.613	-0.118	0.468	-0.024	0.881	-0.074	0.650

Documenting and recording information	-0.133	0.407	-0.059	0.719	-0.152	0.342	-0.046	0.779
Interpreting the meaning of information for others	<b>-0.278</b>	<b>0.079</b>	-0.193	0.232	-0.175	0.274	0.040	0.805
Communicating with supervisors peer or subordinates	-0.137	0.394	-0.064	0.694	0.018	0.910	0.145	0.373
Communicating with persons outside organization	-0.188	0.240	-0.107	0.511	-0.064	0.693	0.081	0.620
Establishing and maintaining interpersonal relationships	-0.237	0.135	-0.162	0.318	-0.082	0.612	0.066	0.666
Assisting and caring for others	-0.002	0.988	0.073	0.653	0.017	0.918	0.127	0.437
Selling or influencing others	<b>-0.386</b>	<b>0.013</b>	<b>-0.341</b>	<b>0.031</b>	-0.214	0.180	-0.120	0.460
Resolving conflicts and negotiating with others	-0.206	0.196	-0.159	0.328	0.039	0.808	0.129	0.427
Performing for/ or working directly with the public	-0.085	0.597	-0.043	0.794	-0.004	0.980	0.062	0.704
Coordinating the work and activities of others	-0.181	0.257	-0.109	0.501	-0.014	0.933	0.118	0.470
Developing and building teams	-0.231	0.146	-0.162	0.319	-0.034	0.831	0.103	0.527
Training and teaching others	-0.102	0.526	-0.035	0.830	0.043	0.789	0.156	0.338
Guiding / directing and motivating subordinates	-0.149	0.353	-0.067	0.681	-0.020	0.900	0.122	0.452
Coaching and developing others	-0.144	0.369	-0.085	0.603	0.003	0.983	0.104	0.522
Provide consultation and advice to others	<b>-0.341</b>	<b>0.029</b>	<b>-0.288</b>	<b>0.071</b>	-0.180	0.259	0.040	0.807
Performing administrative activities	-0.249	0.117	-0.186	0.249	-0.151	0.346	-0.042	0.797
Staffing organizational units	-0.206	0.196	-0.121	0.455	0.033	0.837	0.216	0.181
Monitoring and controlling resources	<b>-0.333</b>	<b>0.033</b>	-0.279	0.081	-0.130	0.419	-0.014	0.933
Arm and hand steadiness	0.198	0.214	-0.137	0.400	0.100	0.532	-0.002	0.922
Auditory attention	<b>0.270</b>	<b>0.088</b>	0.261	0.104	0.257	0.104	0.247	0.124
Category flexibility	-0.205	0.200	-0.159	0.326	-0.207	0.195	-0.142	0.383
Control precision	<b>0.273</b>	<b>0.084</b>	0.232	0.149	0.217	0.173	0.154	0.344
Dynamic flexibility	0.041	0.798	-0.018	0.914	0.175	0.275	0.102	0.530
Dynamic strength	0.196	0.220	0.118	0.469	0.255	0.107	0.148	0.364
Explosive strength	0.094	0.561	0.072	0.660	<b>0.316</b>	<b>0.044</b>	<b>0.297</b>	<b>0.062</b>
Extent flexibility	0.203	0.202	0.116	0.476	0.226	0.156	0.094	0.562
Far vision	0.227	0.154	0.215	0.182	0.256	0.106	0.243	0.131
Finger dexterity	0.145	0.365	0.124	0.445	0.055	0.734	0.022	0.895
Flexibility of closure	0.060	0.711	0.131	0.421	0.059	0.715	0.159	0.326

Fluency of ideas	<b>-0.282</b>	<b>0.074</b>	-0.206	0.202	-0.168	0.293	-0.008	0.963
Glare sensitivity	<b>0.328</b>	<b>0.036</b>	<b>0.295</b>	<b>0.065</b>	<b>0.408</b>	<b>0.008</b>	<b>0.367</b>	<b>0.020</b>
Gross body coordination	0.195	0.222	0.116	0.476	<b>0.288</b>	<b>0.068</b>	0.184	0.255
Gross body equilibrium	0.236	0.138	0.185	0.254	<b>0.270</b>	<b>0.088</b>	0.199	0.219
Hearing sensitivity	0.24	0.131	0.242	0.133	0.213	0.181	0.218	0.177
Inductive reasoning	-0.204	0.200	-0.124	0.446	-0.100	0.535	0.044	0.790
Information ordering	-0.226	0.155	-0.166	0.307	-0.174	0.277	-0.076	0.640
Manual dexterity	0.215	0.177	0.153	0.345	0.157	0.327	0.058	0.721
Mathematical reasoning	-0.207	0.195	-0.146	0.370	-0.188	0.239	-0.096	0.556
Memorization	-0.254	0.109	-0.182	0.260	-0.229	0.150	-0.111	0.496
Multi-limb coordination	<b>0.262</b>	<b>0.097</b>	0.201	0.214	<b>0.293</b>	<b>0.063</b>	0.203	0.209
Near vision	-0.078	0.629	-0.069	0.671	-0.102	0.528	-0.091	0.575
Night vision	<b>0.291</b>	<b>0.065</b>	<b>0.273</b>	<b>0.088</b>	<b>0.423</b>	<b>0.006</b>	<b>0.406</b>	<b>0.009</b>
Number Facility	-0.165	0.303	-0.118	0.470	-0.188	0.240	-0.122	0.453
Oral Comprehension	-0.151	0.345	-0.090	0.580	-0.163	0.310	-0.074	0.648
Oral Expression	-0.158	0.324	-0.078	0.634	-0.129	0.423	-0.004	0.978
Originality	-0.256	0.106	-0.171	0.291	-0.128	0.425	0.058	0.724
Perceptual Speed	0.199	0.213	0.262	0.102	0.162	0.311	0.250	0.120
Peripheral Vision	<b>0.324</b>	<b>0.039</b>	<b>0.292</b>	<b>0.068</b>	<b>0.435</b>	<b>0.005</b>	<b>0.397</b>	<b>0.011</b>
Problem Sensitivity	-0.089	0.581	-0.040	0.809	-0.043	0.788	0.030	0.853
Rate Control	<b>0.304</b>	<b>0.053</b>	<b>0.274</b>	<b>0.087</b>	<b>0.325</b>	<b>0.038</b>	<b>0.284</b>	<b>0.076</b>
Reaction Time	0.290	0.066	0.246	0.127	<b>0.317</b>	<b>0.044</b>	0.254	0.113
Response Orientation	<b>0.356</b>	<b>0.022</b>	<b>0.321</b>	<b>0.043</b>	<b>0.387</b>	<b>0.012</b>	<b>0.339</b>	<b>0.032</b>
Selective Attention	0.022	0.889	0.026	0.871	0.083	0.605	0.092	0.574
Sound Localization	0.247	0.120	0.228	0.158	<b>0.376</b>	<b>0.015</b>	<b>0.358</b>	<b>0.023</b>
Spatial Orientation	<b>0.280</b>	<b>0.076</b>	0.232	0.149	<b>0.367</b>	<b>0.018</b>	<b>0.304</b>	<b>0.056</b>
Speech Clarity	-0.152	0.343	-0.116	0.474	-0.161	0.316	-0.111	0.495
Speech Recognition	-0.149	0.354	-0.081	0.620	-0.121	0.452	-0.018	0.911
Speed of Closure	0.021	0.898	0.126	0.439	0.067	0.676	0.224	0.165
Speed of Limb Movement	<b>0.274</b>	<b>0.083</b>	0.225	0.163	<b>0.373</b>	<b>0.016</b>	<b>0.309</b>	<b>0.052</b>
Stamina	0.183	0.253	0.102	0.531	<b>0.270</b>	<b>0.088</b>	0.164	0.313
Static Strength	0.196	0.219	0.114	0.483	<b>0.286</b>	<b>0.070</b>	0.177	0.274
Time Sharing	0.094	0.560	0.110	0.498	0.135	0.399	0.162	0.318
Trunk Strength	0.188	0.238	0.099	0.545	0.201	0.207	0.066	0.687
Visual Color Discrimination	0.124	0.440	0.116	0.476	0.050	0.755	0.037	0.821
Visualization	-0.054	0.737	-0.023	0.888	-0.023	0.887	0.023	0.890
Wrist/ Finger Speed	0.245	0.122	0.208	0.198	0.088	0.583	0.024	0.882
Written Comprehension	-0.186	0.244	-0.110	0.500	-0.189	0.237	-0.074	0.649
Written Expression	-0.203	0.204	-0.102	0.530	-0.161	0.316	0.014	0.932

Deductive Reasoning	-0.196	0.219	-0.098	0.548	-0.089	0.580	0.097	0.550
Depth Perception	<b>0.283</b>	<b>0.073</b>	<b>0.270</b>	<b>0.092</b>	<b>0.309</b>	<b>0.050</b>	0.294	0.066
Active Learning	-0.199	0.212	-0.135	0.408	-0.199	0.212	-0.103	0.527
Active Listening	-0.141	0.379	-0.075	0.645	-0.190	0.234	-0.100	0.540
Complex Problem Solving	-0.200	0.210	-0.080	0.622	-0.106	0.509	0.142	0.383
Coordination	-0.068	0.673	0.027	0.867	-0.031	0.845	0.113	0.489
Critical Thinking	-0.189	0.236	-0.084	0.607	-0.143	0.373	0.040	0.805
Equipment Maintenance	0.125	0.438	0.063	0.699	0.189	0.235	0.107	0.510
Equipment Selection	-0.146	0.361	-0.198	0.220	-0.069	0.669	-0.138	0.396
Installation	-0.127	0.428	-0.170	0.293	-0.042	0.792	-0.099	0.542
Instructing	-0.115	0.472	-0.088	0.588	-0.131	0.414	-0.094	0.563
Judgment and Decision Making	-0.180	0.261	-0.086	0.596	-0.091	0.572	0.073	0.654
Learning Strategies	-0.197	0.216	-0.138	0.397	-0.126	0.431	-0.030	0.854
Management of Financial Resources	<b>-0.379</b>	<b>0.014</b>	<b>-0.331</b>	<b>0.037</b>	-0.204	0.201	-0.100	0.541
Management of Material Resources	<b>-0.307</b>	<b>0.051</b>	<b>-0.286</b>	<b>0.073</b>	-0.129	0.422	-0.093	0.567
Management of Personnel Resources	-0.207	0.194	-0.140	0.388	-0.049	0.761	0.073	0.655
Mathematics	-0.249	0.116	-0.233	0.148	<b>-0.264</b>	<b>0.096</b>	-0.244	0.129
Monitoring	-0.097	0.547	-0.008	0.960	-0.023	0.884	0.118	0.469
Negotiations	-0.229	0.150	-0.153	0.346	0.027	0.868	0.193	0.233
Operation and Control	<b>0.344</b>	<b>0.027</b>	<b>0.318</b>	<b>0.046</b>	<b>0.302</b>	<b>0.055</b>	0.262	0.102
Operation Monitoring	<b>0.307</b>	<b>0.050</b>	<b>0.299</b>	<b>0.061</b>	0.239	0.133	0.227	0.159
Operations and Analysis	<b>-0.322</b>	<b>0.040</b>	<b>-0.294</b>	<b>0.065</b>	-0.205	0.198	-0.159	0.327
Persuasion	-0.230	0.147	-0.156	0.338	-0.131	0.414	0.003	0.983
Programing	-0.212	0.184	-0.163	0.316	-0.024	0.881	0.064	0.695
Quality Control / Analysis	-0.185	0.248	-0.175	0.279	-0.054	0.735	-0.038	0.818
Reading Comprehension	-0.158	0.323	-0.093	0.567	-0.183	0.252	-0.091	0.577
Repeating	0.059	0.712	0.011	0.947	0.112	0.485	0.047	0.773
Science	-0.213	0.180	-0.152	0.348	-0.301	0.056	-0.221	0.170
Service Orientation	-0.166	0.300	-0.129	0.426	-0.123	0.444	-0.069	0.671
Social Perceptiveness	-0.186	0.245	-0.120	0.461	-0.008	0.961	0.112	0.491
Speaking	-0.122	0.448	-0.044	0.788	-0.126	0.434	-0.012	0.940
Systems Analysis	-0.120	0.456	-0.024	0.881	0.011	0.944	0.177	0.273
Systems Evaluation	-0.198	0.215	-0.116	0.414	0.018	0.912	0.183	0.258
Technology Design	-0.246	0.121	-0.209	0.195	-0.119	0.458	-0.058	0.720
Time Management	-0.251	0.114	-0.209	0.195	-0.147	0.361	-0.079	0.629
Troubleshooting	0.069	0.669	0.071	0.662	0.076	0.635	0.081	0.619
Writing	-0.254	0.109	-0.191	0.237	-0.199	0.213	-0.095	0.560

Artistic	<b>-0.327</b>	<b>0.037</b>	<b>-0.282</b>	<b>0.077</b>	<b>-0.309</b>	<b>0.050</b>	-0.240	0.137
Conventional	0.043	0.790	-0.014	0.932	0.085	0.598	0.008	0.963
Enterprising	0.014	0.929	0.045	0.782	0.122	0.446	0.172	0.289
Investigative	-0.227	0.153	-0.121	0.457	<b>-0.332</b>	<b>0.034</b>	-0.195	0.228
Realistic	0.162	0.312	0.090	0.580	0.202	0.204	0.102	0.531
Social	-0.090	0.575	-0.022	0.891	-0.097	0.545	0.000	0.998
Achievement Effort	<b>-0.264</b>	<b>0.095</b>	-0.194	0.229	-0.120	0.455	0.019	0.910
Adaptability / Flexibility	-0.192	0.229	-0.130	0.422	-0.026	0.871	0.084	0.606
Analytical Thinking	-0.205	0.199	-0.091	0.578	-0.105	0.513	0.131	0.421
Attention to Detail	-0.163	0.309	-0.112	0.492	-0.068	0.674	0.014	0.930
Concern for Others	-0.034	0.832	0.030	0.854	0.075	0.641	0.177	0.274
Cooperation	-0.140	0.382	-0.106	0.515	0.023	0.885	0.082	0.617
Dependability	-0.137	0.393	-0.091	0.578	0.055	0.735	0.135	0.405
Independence	-0.163	0.307	-0.113	0.486	0.146	0.364	0.244	0.129
Initiative	-0.225	0.158	-0.153	0.346	-0.004	0.981	0.143	0.379
Innovation	<b>-0.284</b>	<b>0.072</b>	-0.217	0.178	-0.070	0.665	0.079	0.629
Integrity	<b>-0.275</b>	<b>0.082</b>	-0.227	0.159	-0.064	0.689	0.026	0.872
Leadership	-0.104	0.518	-0.006	0.971	0.047	0.769	0.221	0.171
Persistence	-0.244	0.124	-0.169	0.296	-0.025	0.878	0.136	0.403
Self-Control	0.031	0.846	0.068	0.676	0.163	0.310	0.223	0.167
Social Orientation	-0.118	0.464	-0.059	0.717	0.007	0.965	0.103	0.526
Stress Tolerance	-0.063	0.694	-0.002	0.989	0.033	0.836	0.129	0.426
Ability Utilization	-0.194	0.224	-0.076	0.640	-0.218	0.171	-0.033	0.839
Achievement	-0.176	0.277	-0.057	0.730	-0.218	0.178	-0.039	0.816
Activity	-0.203	0.210	-0.144	0.382	-0.067	0.682	0.036	0.828
Advancement	-0.130	0.425	-0.109	0.510	0.011	0.945	0.049	0.767
Authority	-0.036	0.824	0.100	0.545	-0.021	0.896	0.185	0.260
Autonomy	-0.278	0.176	-0.121	0.464	-0.191	0.237	-0.024	0.882
Company Policies and Practices	0.125	0.443	0.083	0.617	<b>0.388</b>	<b>0.013</b>	<b>0.347</b>	<b>0.030</b>
Compensation	-0.075	0.646	0.054	0.744	-0.150	0.356	0.025	0.880
Coworkers	-0.105	0.521	-0.042	0.798	-0.049	0.766	0.049	0.766
Creativity	<b>-0.340</b>	<b>0.032</b>	-0.269	0.098	-0.255	0.112	-0.094	0.568
Moral Values	0.045	0.781	-0.070	0.673	0.105	0.517	-0.053	0.748
Recognition	-0.193	0.232	-0.083	0.617	-0.209	0.196	-0.033	0.841
Responsibility	-0.198	0.220	-0.089	0.591	-0.189	0.242	-0.008	0.962
Security	-0.064	0.697	0.034	0.837	0.013	0.937	0.171	0.299
Social Service	-0.100	0.539	-0.014	0.934	-0.151	0.354	-0.029	0.861
Social Status	-0.192	0.235	-0.060	0.719	-0.210	0.193	0.006	0.970
Supervision Human Relations	0.122	0.453	0.055	0.740	<b>0.403</b>	<b>0.010</b>	<b>0.335</b>	<b>0.037</b>

Supervision Technical	0.241	0.135	0.144	0.381	<b>0.393</b>	<b>0.012</b>	<b>0.275</b>	<b>0.090</b>
Variety	<b>-0.278</b>	<b>0.083</b>	-0.203	0.215	-0.204	0.208	-0.067	0.686
Working Conditions	-0.192	0.234	-0.126	0.445	-0.249	0.122	-0.155	0.346

Note: numbers in bold are significant at  $p < 0.10$ , two tailed

**Table 10: Occupational tasks with statistical significant associations with obesity**

Occupational Task	Women		Women with wage controlled		Men		Men with wage controlled	
	Correlation Coefficient	p-value	Correlation Coefficient	p-value	Correlation Coefficient	p-value	Correlation Coefficient	p-value
Consequence of error			<b>0.335</b>	<b>0.035</b>				
Deal with physically aggressive people							<b>0.333</b>	<b>0.036</b>
Electronic Mail	<b>-0.341</b>	<b>0.029</b>	-0.280	0.081				
Exposed to contaminants	<b>0.313</b>	<b>0.046</b>	0.268	0.095	<b>0.308</b>	<b>0.050</b>		
Exposed to high places	0.277	0.080						
Exposed to radiation					<b>-0.370</b>	<b>0.017</b>	-0.270	0.092
Freedom to make decisions							0.269	0.093
In an enclosed vehicle or equipment					<b>0.308</b>	<b>0.050</b>	0.289	0.070
In an open vehicle or equipment					0.279	0.077		
In doors environmentally controlled					-0.261	0.099		
In doors not environmentally controlled					<b>0.340</b>	<b>0.029</b>	0.292	0.067
Letters and memos	-0.292	0.064						
Outdoors exposed to weather					<b>0.347</b>	<b>0.026</b>	0.287	0.073
Outdoors under cover					0.277	0.079		
Public speaking	-0.264	0.096						
Responsibility for others health and safety					0.371	0.017	<b>0.390</b>	<b>0.013</b>
Spend time climbing ladders, scaffolds or poles	0.260	0.100						
Time pressure					0.288	0.068	<b>0.375</b>	<b>0.017</b>
Very hot or very cold temperature					<b>0.386</b>	<b>0.013</b>	<b>0.317</b>	<b>0.046</b>
Monitor process materials surroundings					0.273	0.084	<b>0.381</b>	<b>0.015</b>
Inspecting equipment, structures or material					0.302	0.055		
Thinking creatively	-0.292	0.064						



Updating and using relevant knowledge	-0.274	0.083						
Scheduling work and activities	-0.305	0.052						
Organizing , planning and prioritizing work	-0.292	0.064						
Performing general physical activities					<b>0.308</b>	<b>0.050</b>		
Operating vehicles and mechanized devices or equipment					<b>0.377</b>	<b>0.015</b>	<b>0.313</b>	<b>0.049</b>
Interacting with computers	<b>-0.330</b>	<b>0.035</b>	-0.282	0.078				
Interpreting the meaning of information for others	-0.278	0.079						
Selling or influencing others	<b>-0.386</b>	<b>0.013</b>	<b>-0.341</b>	<b>0.031</b>				
Provide consultation and advice to others	<b>-0.341</b>	<b>0.029</b>	-0.288	0.071				
Monitoring and controlling resources	<b>-0.333</b>	<b>0.033</b>	-0.279	0.081				
Auditory attention	0.270	0.088						
Control precision	0.273	0.084						
Explosive strength					<b>0.316</b>	<b>0.044</b>	0.297	0.062
Fluency of ideas	-0.282	0.074						
Glare sensitivity	<b>0.328</b>	<b>0.036</b>	0.295	0.065	<b>0.408</b>	<b>0.008</b>	<b>0.367</b>	<b>0.020</b>
Gross body coordination					0.288	0.068		
Gross body equilibrium					0.270	0.088		
Multi-limb coordination	0.262	0.097			0.293	0.063		
Night vision	0.291	0.065	0.273	0.088	<b>0.423</b>	<b>0.006</b>	0.406	0.009
Peripheral Vision	<b>0.324</b>	<b>0.039</b>	0.292	0.068	<b>0.435</b>	<b>0.005</b>	<b>0.397</b>	<b>0.011</b>
Rate Control	0.304	0.053	0.274	0.087	<b>0.325</b>	<b>0.038</b>	0.284	0.076
Reaction Time	0.290	0.066			<b>0.317</b>	<b>0.044</b>		
Response Orientation	<b>0.356</b>	<b>0.022</b>	<b>0.321</b>	<b>0.043</b>	<b>0.387</b>	<b>0.012</b>	<b>0.339</b>	<b>0.032</b>
Sound Localization					<b>0.376</b>	<b>0.015</b>	0.358	0.023
Spatial Orientation	0.280	0.076			<b>0.367</b>	<b>0.018</b>	0.304	0.056
Speed of Limb Movement	0.274	0.083			<b>0.373</b>	<b>0.016</b>	0.309	0.052
Stamina					0.270	0.088		
Static Strength					0.286	0.070		
Depth Perception	0.283	0.073	0.270	0.092	<b>0.309</b>	<b>0.050</b>	0.294	0.066
Management of Financial Resources	<b>-0.379</b>	<b>0.014</b>	<b>-0.331</b>	<b>0.037</b>				
Management of Material Resources	-0.307	0.051	-0.286	0.073				
Mathematics					-0.264	0.096		

Operation and Control	<b>0.344</b>	<b>0.027</b>	<b>0.318</b>	<b>0.046</b>	0.302	0.055		
Operation Monitoring	<b>0.307</b>	<b>0.050</b>	0.299	0.061				
Operations and Analysis	<b>-0.322</b>	<b>0.040</b>	-0.294	0.065				
Science					-0.301	0.056		
Artistic	<b>-0.327</b>	<b>0.037</b>	-0.282	0.077	<b>-0.309</b>	<b>0.050</b>		
Investigative					<b>-0.332</b>	<b>0.034</b>		
Achievement Effort	-0.264	0.095						
Innovation	-0.284	0.072						
Integrity	-0.275	0.082						
Company Policies and Practices					<b>0.388</b>	<b>0.013</b>	<b>0.347</b>	<b>0.030</b>
Creativity	<b>-0.340</b>	<b>0.032</b>	-0.269	0.098				
Supervision Human Relations					<b>0.403</b>	<b>0.010</b>	<b>0.335</b>	<b>0.037</b>
Supervision Technical					<b>0.393</b>	<b>0.012</b>	0.275	0.090
Variety	-0.278	0.083						

**Note: numbers in bold are significant at  $p < 0.05$ , two tailed**

Sixty-nine (69) of the 224 occupational tasks and characteristics had statistically significant associations at the  $p < 0.10$  level for either women or men, or (in a few cases) for both (see Table 10). Several of the tasks and characteristics that showed statistical significance on the first analysis became non-significant when the estimated average hourly wage was added as a confounder (see Tables 9 and 10).

Several job tasks and characteristics showed positive associations with higher rates of obesity at statistically significant levels ( $p < 0.10$ ) for both genders (see Table 10). This positive association held both without and with controlling for the introduction of the hourly wage. The  $p$  values shown below for each of the tasks and characteristics are for both without / with controlling for wages:

- glare sensitivity ( $p = 0.036$  /  $p = 0.065$  and  $p = 0.008$  /  $p = 0.020$ ),
- night vision ( $p = 0.065$  /  $p = 0.088$  and  $p = 0.006$  /  $p = 0.009$ ),
- peripheral vision ( $p = 0.039$  /  $p = 0.068$  and  $p = 0.005$  /  $p = 0.011$ ),

- rate or speed control ( $p = 0.053 / p = 0.087$  and  $p = 0.038 / p = 0.076$ ),
- response orientation ( $p = 0.022 / p = 0.043$  and  $p = 0.012 / p = 0.032$ ) and
- depth perception when performing work ( $p = 0.073 / p = 0.092$  and  $p = 0.050 / p = 0.066$ ).

Associations for other tasks and characteristics were different for each gender.

For women, obesity rates were associated with the following tasks and characteristics (see Table 10), without and with controlling for average wage as a confounding variable:

Tasks and characteristics with positive association with obesity rates (i.e. risk factor):

- exposed to contaminants ( $p = 0.046 / p = 0.095$ )

Tasks and characteristics with negative association with obesity rates (i.e. protective):

- electronic mail ( $p = 0.029 / p = 0.081$ )
- interacting with computers ( $p = 0.035 / p = 0.078$ )
- selling or influencing others ( $p = 0.013 / p = 0.031$ )
- provide consultation and advice to others ( $p = 0.029 / p = 0.071$ )
- monitoring and controlling resources ( $p = 0.033 / p = 0.081$ )
- management of financial resources ( $p = 0.014 / p = 0.037$ )
- management of material resources ( $p = 0.051 / p = 0.073$ )
- operation and control ( $p = 0.027 / p = 0.046$ )
- operation monitoring ( $p = 0.050 / p = 0.061$ )
- operation and analysis ( $p = 0.040 / p = 0.065$ )
- artistic ( $p = 0.037 / p = 0.077$ )

- creativity ( $p = 0.032 / p = 0.098$ )

For men, obesity had statistically significant associations with the following tasks and characteristics, with and without the introduction of the estimated average hourly wage as a confounder (see Table 10):

Tasks and characteristics with positive association with obesity (i.e. risk factor)

- working in an enclosed vehicle or equipment ( $p = 0.050 / p = 0.070$ )
- working indoors not environmentally controlled ( $p = 0.029 / p = 0.067$ )
- working outdoors exposed to weather ( $p = 0.026 / p = 0.073$ )
- responsibility for others' health and safety ( $p = 0.017 / p = 0.013$ )
- time pressure ( $p = 0.068 / p = 0.017$ )
- working in very hot or very cold temperature ( $p = 0.013 / p = 0.046$ )
- monitor process materials or surroundings ( $p = 0.084 / p = 0.015$ )
- operating vehicles and mechanized devices or equipment ( $p = 0.015 / p = 0.049$ )
- explosive strength ( $p = 0.044 / p = 0.062$ )
- sound localization ( $p = 0.015 / p = 0.023$ )
- spatial orientation ( $p = 0.018 / p = 0.05$ )
- speed of limbs movement ( $p = 0.016 / p = 0.052$ )
- company policies and practices ( $p = 0.013 / p = 0.030$ )
- supervision of human relations ( $p = 0.010 / p = 0.037$ )
- supervision technical ( $p = 0.012 / p = 0.090$ )

Task and characteristics with negative association with obesity (i.e. protective)

- exposed to radiation ( $p = 0.017 / p = 0.092$ )

Additional statistically significant associations were found among women for the following tasks and characteristics, but became statistically insignificant when controlling for wages (see Table 10):

Tasks and characteristics with positive statistical association

- exposed to high places ( $p = 0.080$ )
- spending time climbing ladders, scaffolds or poles ( $p = 0.100$ )
- auditory attention ( $p = 0.088$ )
- control precision ( $p = 0.04$ )
- multi-limb coordination ( $p = 0.097$ )
- reaction time ( $p = 0.066$ )
- spatial orientation ( $p = 0.076$ )
- speed of limb movement ( $p = 0.083$ )

Tasks and characteristics with reversed statistical association

- letters and memos ( $p = 0.064$ )
- public speaking ( $p = 0.096$ )
- thinking creatively ( $p = 0.064$ )
- updating and using relevant knowledge ( $p = 0.083$ )
- scheduling work and activities ( $p = 0.052$ )
- organizing, planning and prioritizing work ( $p = 0.064$ )
- interpreting the meaning of information for others ( $p = 0.079$ )
- fluency of ideas ( $p = 0.074$ )
- achievement effort ( $p = 0.095$ )
- innovation ( $p = 0.072$ )

- integrity ( $p = 0.082$ )
- variety ( $p = 0.083$ )

The consequence of error characteristic was found to have a statistically significant association ( $p = 0.035$ ) with obesity rates for women only when the estimated average hourly wage was introduced as confounding variable.

Among men, the following occupational tasks and characteristics demonstrated a significant relationship with obesity prevalence, but lost statistical significance when controlling for wages (see Table 10).

#### Tasks and characteristics with positive statistical association

- exposed to contaminants ( $p = 0.050$ )
- working in an open vehicle or equipment ( $p = 0.077$ )
- working outdoors undercover ( $p = 0.079$ )
- inspecting equipment, structure or material ( $p = 0.055$ )
- performing general physical activities ( $p = 0.050$ )
- gross body coordination ( $p = 0.068$ )
- gross body equilibrium ( $p = 0.088$ )
- multi-limb coordination ( $p = 0.063$ )
- reaction time ( $p = 0.044$ )
- stamina ( $p = 0.088$ )
- static strength ( $p = 0.070$ )
- operation and control ( $p = 0.055$ )

#### Tasks and characteristics with reversed statistical association

- working indoors, environmentally controlled ( $p = 0.099$ )

- mathematics ( $p = 0.096$ )
- science ( $p = 0.056$ )
- investigative ( $p = 0.034$ )

Dealing with physically aggressive people showed a statistically significant association with obesity prevalence for men only when the estimated average hourly wage was included as a confounding variable ( $p = 0.036$ ).

From the three broad occupational tasks, the only factor significantly associated (positive) with obesity prevalence was physical demands (Factor 1); ( $p=0.094$  for women and  $p=0.072$  for men, as seen in Table 11). However, this relationship became non-significant when the mean hourly wage was added as a possibly confounding variable ( $p=0.179$  for women and  $0.185$  for men).

**Table 11: Summary of statistical analysis for the three task factors**

Occupational Factors	Women		Women with wage		Men		Men with wage	
	Correlation Coefficient	$p$ -value	Correlation Coefficient	$p$ -value	Correlation Coefficient	$p$ -value	Correlation Coefficient	$p$ -value
Physical demands	<b>0.268</b>	<b>0.094</b>	0.220	0.179	0.287	0.072	0.217	0.185
Complexity of the job	-0.232	0.150	-0.108	0.512	-0.224	0.164	0.012	0.944
Working with people vs. things	-0.031	0.848	0.060	0.715	0.026	0.873	0.169	0.303

**Note: numbers in bold are significant at  $p < 0.10$ , two tailed**

Table 12 shows the classification of the occupational tasks and characteristics with statistical association sorted by occupational factor. Tasks and characteristics have been organized by strength of association (lower to higher  $p$  value). The bold-italicized tasks and characteristics listed in the three column headings on Table 12 demonstrated

significant positive associations with obesity prevalence. The physical demands factor has more occupational tasks and characteristics associated with obesity when compared with the other two groups (complexity of job and working with people vs. things). In addition, the majority of the occupational tasks and characteristics included in the physical demand factor group present a positive statistical association with obesity. Occupational tasks and characteristics included in the group for complexity of the job presented primarily reversed statistical association.

**Table 12: Classification of occupational tasks associated with obesity**

Physical Demands	Complexity of the job	Working with people vs. things
<i>Very hot or very cold temperature</i>	<i>Supervision Human Relations</i>	Selling or influencing others
<i>Sound Localization</i>	<i>Supervision Technical</i>	<i>Operating vehicles and mechanized devices or equipment</i>
Expose to radiation	<i>Company Policies and Practices</i>	Electronic Mail
<i>Response Orientation</i>	Management of Financial Resources	<i>Deal with physically aggressive people</i>
<i>Outdoors exposed to weather</i>	<i>Responsibility for others health and safety</i>	Interacting with computers
<i>In doors not environmentally controlled</i>	<i>Operation and Control</i>	<i>Inspecting equipment, structures or material</i>
<i>Glare sensitivity</i>	Provide consultation and advice to others	Letters and memos
<i>Peripheral Vision</i>	Creativity	
<i>Explosive strength</i>	Monitoring and controlling resources	
<i>Expose to contaminants</i>	Investigative	
<i>In an enclosed vehicle or equipment</i>	Artistic	
<i>Performing general physical activities</i>	Operations and Analysis	
<i>Rate Control</i>	Management of Material Resources	
<i>Night vision</i>	<i>Operation Monitoring</i>	
<i>Reaction Time</i>	Scheduling work and activities	
<i>Gross body coordination</i>	Science	



<i>Time pressure</i>	Organizing , planning and prioritizing work	
<i>Static Strength</i>	Thinking creatively	
<i>Spatial Orientation</i>	Innovation	
<i>In an open vehicle or equipment</i>	Fluency of ideas	
<i>Outdoors under cover</i>	Interpreting the meaning of information for others	
<i>Speed of Limb Movement</i>	Variety	
<i>Control precision</i>	Updating and using relevant knowledge	
<i>Auditory attention</i>	<i>Freedom to make decisions</i>	
<i>Gross body equilibrium</i>	Achievement Effort	
<i>Stamina</i>	Mathematics	
In doors environmentally controlled	Public speaking	
<i>Multi-limb coordination</i>	<i>Monitor process materials or surroundings</i>	
<i>Spend time climbing ladders, scaffolds or poles</i>		
<i>Expose to high places</i>		

***Bold-italicized tasks and characteristics showed positive association with obesity***

## **Discussion**

Of the three occupational factors (Table 11), only the physical demands factor showed a significant (positive) association with obesity. This result contradicts the previously presented theory that associates increased physical demands with decreased risk for obesity. The statistical significance vanished after the mean hourly wage was introduced to the correlation between occupational characteristics and tasks and obesity prevalence. A possible explanation for the change of association could be the socioeconomic level of workers whose jobs involve a high level of physical demands. Occupations with more physical tasks and characteristics might pay lower hourly wages than other occupations, or the employees in these jobs may be less educated. As presented by OES, some of the occupations with the lowest wages are farming, building and ground cleaning and maintenance as well as fishing and forestry, among others (Bureau of Labor Statistics, 2006). Obesity had been previously associated with socioeconomic status (Ogden and Flegal, 2010). According to research studies, obesity and socioeconomic status are inversely associated; individuals with low socioeconomic status are more likely to be obese (Sarlio-Lahteenkorva, Lissau and Lahelma, 2005). Socioeconomic status, caloric intake and food choices are also an important part of the obesity issue because food cost will most likely influence food choice (Rolls, Moris, and Roe, 2002). Furthermore, moderate to intense levels of regular physical activity increase the caloric intake needed to compensate for the energy expenditure (Melzer, et al., 2005). Additional investigation is necessary to explain these findings.

Few job characteristics or tasks related to the physical demand factor showed statistical significance for women and men (see Tables 9 and 10) with and without the

introduction of the economic confounding variable. Among those tasks and characteristics were: glare sensitivity, night vision, peripheral vision, rate control, response origination and depth perception. Every one of these tasks or job characteristics has positive correlation coefficients (i.e., was associated with higher obesity levels). As described previously in this section, these occupational characteristics and tasks belong to the physical demands factor. These results do not support the hypothesis about the relationship between the physical demands of an occupation and obesity; in this instance physical demands increase the risk of becoming obese. However, it might be easier to comprehend these results if they are evaluated by looking at occupations that have high levels of these attributes. For example, motor vehicle operation and other transportation jobs are some of the occupations with the highest prevalence of obesity (Table 7 and 8) and they continuously require vision related tasks. Furthermore, night vision could be linked to shiftwork; and the night shift in turn has been associated with obesity (Zhao, et al., 2011).

Statistical results for other jobs characteristics and tasks varied between genders. The analysis indicated a possible connection between the physical demands factor and obesity. In addition, most of the occupational tasks and characteristics with statistical association included in the physical demands group presented a positive association with obesity. The statistical association for several of the occupational tasks and characteristics included in the physical demands groups had a  $p$  value  $< 0.050$ , especially for the male population (see Table 10). All these statistical results contribute to the overall relationship between physical demands and obesity; jobs with more physical demands increase the risk for obesity.

As indicated in Tables 7 and 8, the mean wage for the five occupations with the lowest obesity prevalence is greater than the mean wage for the five occupations with the highest obesity prevalence. This finding is consistent for both women and men. This information supports the theory that obesity is directly associated with income or socioeconomic level. However, it is worth noting that the occupations with lowest obesity prevalence do not necessarily have the highest mean hourly wage. Similarly, the occupations with the highest obesity prevalence do not carry the lowest mean hourly wage. In other words, the general finding that occupations with lower wages have higher proportions of obesity is not a perfect association. Additional research is necessary to establish a more definite relationship between income and obesity.

Further information of interest can be obtained by analyzing Tables 7, 8 and 11 together. First, the occupations with the highest obesity prevalence are more physically demanding jobs. Also, the tables suggest that physically demanding jobs have lower mean salary and higher obesity. Findings from Tables 7 and 8 are consistent with the statistical results presented in Table 11, which associates physical demands with obesity risk. This information suggests that hourly wage, job characteristics and obesity are all linked to each other. Secondly, the occupations with the highest obesity prevalence require less complexity of decision making, and the employees for some of the occupations may be less educated than the employees included in the five occupations with the lowest obesity prevalence. This might suggest either that education could influence the risk for obesity or, alternatively, that jobs with lower educational requirements have characteristics that increase the risk of obesity. It is possible that less educated workers have poorer diets or eating habits. Since this is a cross-sectional

exploratory study, additional studies are necessary to confirm or reject the theory that suggests that educational level could influence the risk for obesity in relation to occupational tasks.

Many occupational tasks and characteristics showed significant associations ( $p \leq 0.10$ ) with obesity prevalence with and/or without the introduction of the estimated average hourly wage. Table 10 summarized the information presented in Table 9, including only the occupational characteristics and tasks that showed statistical significance ( $p \leq 0.10$ ). However, several occupational characteristics and tasks demonstrated stronger associations ( $p \leq 0.05$ ) with obesity prevalence.

The following occupational characteristics and tasks are more likely to increase the risk of obesity ( $p \leq 0.05$ ): high consequence of error, dealing with physically aggressive people, exposure to contaminants, working in an enclosed vehicle or equipment, working indoors not environmentally controlled or outdoors exposed to weather, responsibility for others' health and safety, working under time pressure, very hot or very cold temperature, monitoring process material or surroundings, operating vehicles and mechanized devices or equipment, performing general physical activities, explosive strength, glare sensitivity, night vision, peripheral vision, rate control, reaction time, response origination, sound localization, spatial orientation, speed of limb movement, operation and control, company policies and practices, supervision of human relations and technical supervision. (see Table 10)

Contrary to the previous paragraph, the following job tasks and characteristics showed strong protective association against obesity ( $p \leq 0.05$ ): using electronic mail, exposure to radiation, interacting with computers, selling or influencing others, providing

consultation and advice to others, monitoring and controlling resources, management of financial resources, operation and analysis, artistic as well as creativity (see Table 10).

Time pressure had a strong positive association with obesity prevalence. Time pressure can generate stress and, as presented in the “Introduction” section, stress has been linked with obesity. Previous research studies have concluded that stress generates negative effects on eating habits as well as behavioral changes, such as excessive food intake, resulting in weight gain (Schulte, et al., 2007; Overgaard and Heitmann, 2006).

Another interesting finding is related to “speed of limb movement.” This occupational characteristic was positively associated with obesity prevalence (i.e., the higher the speed of limb movement required to perform a job, the higher the risk for obesity). This occupational characteristic is a component of the physical activity factor. The literature generally suggests that occupations with a high level of physical activity should have a lower rate of obesity, so this finding did not support the general theory. It is possible that employees developed more muscle mass due to the nature of the job. Since an increased muscle mass can give a false indication of obesity based on BMI, this might partially explain the contradiction. Another possible explanation could be that physical demands tasks and characteristics generate the desire for higher caloric intake, resulting in more calories ingested than were burned by the higher activity level. Additional studies are needed to determine to relationship between this occupational task and obesity prevalence.

Thinking creatively, electronic mail and artistic occupational tasks were associated with lower physical activity and with lower obesity rates. It is possible that employees in these occupations are more conscious about physical appearance because

they might have consistent contact with customers. Also, these employees may experience the need to be in good shape and physical appearance to better perform on their jobs; enhancing their confidence level to aspire and seek professional success such as promotions.

Table 12 shows the occupational characteristics and tasks that were the components of the three major occupational factors. Some examples of the job characteristics and tasks included in the physical demands factor were peripheral vision, night vision, spatial orientation, response orientation, gross body equilibrium, far vision, reaction time, stamina, speed of limbs movement, gross body coordination, multi limb coordination, explosive strength, time spent sitting, and working indoors and outdoors not environmentally controlled (see Table 12). Our results suggest that occupations requiring these types of tasks on a routine basis may increase the risk for employees to develop obesity-- findings that contradict the theory that physical activity could decrease the risk for obesity. Tasks with high physical demands could generate stress on the employees, and stress has been linked to obesity (Barlow, 2011; Vega, 2007). Also, some of these occupational characteristics, such as night vision and glare sensitivity, are related to night shift jobs. Previous studies have suggested that employees working night shift are more likely to develop obesity (Eberly and Feldman, 2010). Additional studies are necessary to determine the relationship between physical activity and obesity.

Consequence of error has also been related to stressful situations and so these results also support the theory that there is an association between stress and obesity.

The factor of complexity of job as a group did not have a significant association with obesity. However, the individual occupational characteristics and tasks included in

this group did have some interesting associations. The complexity of job factor includes characteristics and tasks such as supervision of human resources, responsibility for others' health and safety, technical supervision, providing consultation and advice to others, updating and using relevant knowledge, active learning, critical thinking and public speaking. These occupational characteristics and tasks involve more intense reasoning, higher education, and more complex mental skills, but less physical activity. According to ONET, these job characteristics and tasks require “moderate” effort. Therefore, one might think that they are most likely to increase the obesity risk based on lower physical activity. However, many of these occupational tasks and characteristics were associated with lower obesity. The educational level of the employees engaged in these occupational tasks and characteristics may help explain their lower obesity rates, since education has been associated with a lower risk of obesity. Public speaking, management occupations, and providing consultation to others were also associated with lower obesity rates, which may again be related to higher education and the need to project a healthy and attractive appearance to others, or perhaps higher control (and therefore lower stress). There is a need for further investigation to evaluate the relationship between education level, socio-economic status and cognitive skills with the risk for obesity.

The last factor that involved working with people versus things consisted of tasks such as dealing with physically aggressive people, interacting with computers, letters and memos, inspecting equipment, structure or material, electronic mail and operating vehicles and mechanized devices, among others. As a group, the factor of working with people vs. things did not show a significant association with obesity; however a negative



association with obesity is noted with some component occupational tasks and characteristics. For example; the occupational tasks related to administrative assistance duties, such as letters and memos, electronic email and interacting with computers, contradict the idea that sedentary occupations or low activity jobs have higher obesity risk. It could be that the employees in these jobs are more conscious about their appearance and therefore may have better eating habits or engage in leisure exercises on a regular basis. Conversely, physically demanding jobs may result in lower leisure exercise due to fatigue. An employee's physical appearance could affect the chance of promotion within some companies, and so perhaps there is a selection bias that results in these associations. Further studies could help to answer some of these questions.

Several occupational characteristics and tasks (see Table 10 for full information or Table 13 for presented examples) revealed statistical association for either women or men and in few cases for both genders simultaneously. However, the significant association disappeared when the economic variable was added to the statistical analysis. It seems that socioeconomic factors have a significant effect over the associations. For example (Table 13), investigative task has a protective association with obesity, but the association is lost with the introduction of the mean hourly wage. In this scenario, income might explain the tasks-obesity association. Another example (Table 13), multi-limb coordination tasks has a positive association with obesity for both genders; however the association is eliminated after the introduction of the income variable. Income shows a negative association with obesity. Additional studies are necessary to establish the relationship between task and income. A different scenario is observed with exposure to contaminants (women) and time pressure (men); on both situations (Table 13) the task-

obesity association remains significant after the introduction of income. In these situations something else about the occupational tasks or characteristics explains the association between tasks and obesity. Additional studies are necessary to determine the nature of the relationship between the occupational tasks or characteristic and obesity.

**Table 13: Examples of income effect on association of task with obesity**

	Women		Women with wage controlled		Men		Men with wage controlled	
Occupational Task	Correlation Coefficient	<i>p</i> -value	Correlation Coefficient	<i>p</i> -value	Correlation Coefficient	<i>p</i> -value	Correlation Coefficient	<i>p</i> -value
Exposed to contaminants	<i>0.313</i>	<i>0.046</i>	<i>0.268</i>	<i>0.095</i>	<i>0.308</i>	<i>0.050</i>	0.240	0.135
Time pressure	0.115	0.475	0.168	0.300	<i>0.288</i>	<i>0.068</i>	<i>0.375</i>	<i>0.017</i>
Multi-limb coordination	<i>0.262</i>	<i>0.097</i>	0.201	0.214	<i>0.293</i>	<i>0.063</i>	0.203	0.209
Investigative	<i>-0.227</i>	<i>0.153</i>	-0.121	0.457	<i>-0.332</i>	<i>0.034</i>	-0.195	0.228

Women's obesity prevalence is negatively associated with the following occupational tasks and characteristics (see table 10), with and without the introduction of the estimated average wage as a confounding variable: electronic mail, interacting with computers, artistic and creativity. There was a negative correlation coefficient for each of the mentioned jobs characteristics and tasks (that is associated with lower obesity). Perhaps these jobs characteristics and tasks are less stressful and allow the employees to be better aware of body health. It is possible that jobs involving these tasks and characteristics also require more educated employees. The financial compensation is such that it could also affect this association.

Exposure to contaminants is categorized as an occupational hazard and it is included in the physical demand factor. It has a positive association with obesity, thus increasing the risk for obesity. Results support the idea that occupational hazards could create an unpleasant environment, developing a stressful work environment. Stress has been previously linked to obesity.

The following tasks have a negative correlation coefficient: selling or influencing others, provide consultation and advice to others, monitoring and controlling resources, management of financial resources, operation and analysis and management of material resources. These occupational tasks are more likely to decrease the risk of being obese. These tasks require customer and/or employee contact, so possibly workers performing these tasks are also more aware of their physical appearance. These tasks are also of a managerial nature and the workers might feel that it is important to maintain a certain physical appearance to be promoted. Perhaps, physical appearance is the selection bias of who gets promoted. Operation and control as well as operation monitoring are managerial tasks, but they showed a positive coefficient, indicating the possibility that they could increase the risk for obesity. It would be interesting to develop research that could find the reason for these statistical results.

Men's obesity prevalence had significant association with the following occupational tasks and characteristics, with and without the introduction of the estimated mean hourly wage as a confounding variable (see Table 10): working in an enclosed vehicle or equipment, working in doors not environmentally controlled, working outdoors exposed to weather, time pressure, working in very hot or very cold temperatures, operating vehicles and mechanized devices or equipment, explosive strength, sound

localization, spatial orientation and speed of limbs movement with positive correlation coefficients for each association. These tasks and characteristics are related to physical activity and their statistical association indicates that they increase the chance for obesity. These results do not support that theory of physical activity could decrease the chance of being obese. Company policies and practices, responsibility for others health and safety, supervision of human relations, monitor process materials or surroundings, as well as technical supervision had a positive correlation coefficient. These are managerial tasks and they may be related to stress; therefore, their statistical association indicates the possibility to increase obesity risk. Men could be less concerned about their physical appearance, which could explain the results difference between women and men in a managerial occupation. Exposure to radiation is a physical demand activity and it has a negative correlation coefficient, which indicates that it may decrease the risk for obesity. Jobs that involve exposure to radiation might require a higher educational level and/or employees might receive better financial compensation when compared to other jobs.

Overall, the previous correlations involved occupational tasks and characteristics of physical demands nature and some other tasks and characteristics related to high stress tasks such as supervision of human relations. The data presented on the previous paragraphs do not support the hypothesis presented on this study. According to the statistical analysis, physical demands increase the risk of being obese. It could be that the continuous physical demands generate the desire for higher or continuous caloric intake contributing to obesity. Another explanation could be the use of BMI as the obesity measure. Physical activity could increase muscular mass, resulting in an elevated BMI, thus falsely categorizing these workers as obese.

Also, high stress levels could increase the risk for obesity because it could negatively influence the behavior and eating habits of the employees. Other occupational tasks and characteristics involving extreme conditions and hazardous environments contribute to stressful conditions. Therefore, they support the hypothesis that elevated stress contributes to higher obesity risk.

Several job tasks and characteristics (see table 9) were initially associated with obesity but the statistical significance was lost when the economic variable was introduced as a confounding variable. This makes additional studies necessary to clarify the relationships of socioeconomic level and obesity.

There may be similarities among the occupations with the lowest obesity prevalence (Tables 7 and 8). The five occupations with the lowest obesity prevalence (men and women combined) are occupations that require higher educational levels. Also, the mean average wage for the occupations with lowest obesity prevalence was higher in comparison with the occupations with highest obesity prevalence. These findings call for additional studies that could establish the relation between occupational tasks and characteristics, obesity and socioeconomic level. The jobs with the highest obesity prevalence involve more physical demands and some are considered stressful occupations such as health services and protective services jobs. According to the findings of this exploratory cross-sectional study, physical demands at work and stressful occupational tasks and characteristics appear to contribute to increase the risk for obesity.

## Limitations

This is an exploratory study that has several limitations. The study had the strength of using national data that was collected through surveys conducted by trained personnel. Questionnaires were answered by workers or from their relatives or other proxies. However, self-report may lead to under or over reporting the aspect such as weight; this may or may not be random (for example, very heavy respondents may self-report consistently lower weights than lighter respondents), so this may be either random or systematic error. It may be more accurate to include a physical evaluation of the participant by trained personnel.

The O\*NET data did not include all occupational characteristics (such as shift work, access to food over the day, etc.) and these unmeasured variables may contribute to the variation of obesity between occupations.

Also, groups were not controlled for age, ethnicity or other demographic variables that might have an effect on the findings. The occupational groups included were varied in regards to the number of workers included in each group. In addition, statistical significance was established as  $p \leq 0.10$  because this is an exploratory study. This higher  $p$  value will increase the risk of Type I error (false positives). However, since this is an exploratory study, it is important not to exclude occupational tasks and characteristics that could have significant relationship with the obesity prevalence when more comprehensive study is developed. Adjustment for multiple comparisons was not performed, also increasing the probability for Type 1 error.

Because this is a cross-sectional study, the direction of causality cannot be established. For example, it is possible that some occupations may attract obese workers rather than causing obesity after the workers have joined the occupation.

This exploratory study is considered an ecological study (Pearce, 2000). It is an inexpensive research study and was developed using national obesity and occupational data. It might contain bias leading to an “ecological fallacy” for those occupational tasks and characteristics that showed association to obesity, but the association may not be present when performing studies of actual individuals within a population (Pearce, 2000). Therefore, more in-depth studies are necessary to validate these results.

The number of employees in each of the occupational groups could also have an impact over the overall obesity prevalence. The number of workers included in each of the occupational groups was not consistent; some groups had significantly more than other groups. Small groups may lead to falsely elevated obesity prevalence or falsely low obesity prevalence since the reliability of the sample is lower. For example, small groups may consist of a few obese workers giving false elevated obesity prevalence, but it could be possible that the full occupational group includes a more weight-diverse group. It would be useful to have more consistency (or at least a reasonably high minimum number) in sample size among the occupational groups to increase the reliability of the findings.

## **Conclusion**

The goal of this study was to explore the variety of occupations and determine how the occupational tasks or efforts may contribute to the growing public issue of obesity. After establishing a foundation about possible associations between jobs tasks and characteristics with obesity, it is important to develop more comprehensive studies to investigate these possible relationships between the occupational tasks and characteristics that showed statistical significance and obesity prevalence.

Some job characteristics and tasks demonstrated significant relationships with overall obesity prevalence among both women and men. Tasks and occupational characteristics that were higher in physical demands were significantly associated with higher obesity prevalence. Also, occupations that require working with machinery or equipment had higher risk for obesity. Since physical activity contributes to the development of muscle mass, these associations may be due to misclassification due to the use of BMI to measure obesity. It would be necessary to develop additional studies that determine obesity with an alternative and more accurate measuring tool for obesity, such as dual energy X-ray absorptiometry (DEXA) (Al-Aufi, 2012).

Occupations of a more complex nature and low levels of physical demands resulted in associations with lower obesity prevalence for the most part. However, some managerial tasks were associated with increased chances for obesity. The use of automated equipment, such as electronic mail and computers, showed a lower obesity risk.

Socioeconomic factors seem to have an important effect on these associations. Based on the results of this exploratory study, the influence of income does seem to be as



important as expected based on the literature. Further studies are necessary to validate these findings.

## **Suggested Intervention Strategies**

Workplace interventions have become an important tool to tackle the obesity epidemic. Promoting and maintaining a healthy weight is highly important for employees as well as employers due to the effect of weight on work related injuries (Ostbye, Dement, & Krause, 2007). Effective interventions are extremely necessary to fight the growing obesity epidemic (Williams, et al., 2007). Employer interventions could support behavioral changes among employees. Strategies could include implementing policies and programs such as peer support and environmental initiatives. Contests in the workplace, healthier food choices or promotion of physical activity could all prove effective (Williams, et al., 2007). Such interventions may help to reduce sick time usage, healthcare cost and other expenses related to worker's compensation (Williams, et al., 2007).

The results of this study found a positive association between physically demanding tasks and obesity. Modifications to the tasks positively associated with obesity (such as high physical effort) could help to reduce the effort needed from employees. It would be necessary to perform an evaluation at the workplace, especially for occupations with higher obesity prevalence. Workplace evaluations should produce a customized intervention process depending on the occupation. The evaluation should identify the presence of occupational tasks and characteristics that have been associated with an increased risk for obesity. Evaluation should also include recommendations about modifications and job adjustments that can reduce the risk for obesity.

For example; a laboratory employee might have to uncap 200 test tubes per hour. During the current process the employee picks-up a tube from the delivery rack, uncaps

the tube and places the tube into a processing rack. The process needs to be repeated for each tube and as soon as possible. This process requires multi-limb coordination, high speed limb movement, time pressure, exposure to contaminants, and high levels of body coordination. Additional employees might help to decrease the pressure that it may create on a solo employee. Another possible recommendation could be the introduction of more automated resources such as a decapper or, perhaps, an automated unit onto which the employee places the delivery rack and the subsequent steps will be performed by the automated system. These modifications may facilitate the process and decrease the effort needed by the employee to perform the job.

For occupations that require climbing ladders, scaffolds or poles, a possible intervention could be the use of mechanized ladders or a bucket truck to minimize the effort required by the employees.

Other occupational tasks and characteristics of a managerial nature (supervision of human relations, responsibility for others' health and safety) may be more complicated to find possible interventions. These occupational tasks and characteristics could also generate stress on the employees. Continued education, seminar and support groups (management employee) could help with this scenario. Interventions for occupational tasks and characteristics of this nature require more specialized analysis.

For jobs that involve extreme temperatures (in-doors or enclosed equipment), it might be necessary to regulate the temperature as well as humidity to maintain a balanced and regulated environment. Environmental analysis should be performed to determine the optimal temperature necessary for employees' comfort. It would be recommended to

contact the proper consulting company (for example, engineers and architects) to assist the employers to find solutions/ recommendations to this issue.

In general, education and training are very important during the intervention process. It is important to educate the employee about the most efficient and safest method of performing tasks. Employees need to be aware of available tools that can be utilized to facilitate their jobs and the designated person/ persons who may be available to provide them with informational assistance when needed.

Education is an important part of the intervention process, including increasing employees' awareness of their weight (actual weight vs. ideal weight), health habits and life style, as well as the health features of their work environment (Williams, et al., 2007). Workplace programs that promote healthy eating and physical activity are a way to start fighting employee obesity (Ostbye, et al., 2007). Other approaches that could be used are electronic signs, newsletters, flyers, posters, and healthy choices stickers across the workplace with positive messages that support healthy behaviors incorporating activities that could promote healthy behaviors, such as wellness-themed contest or events and including healthier choices in the cafeteria menu (Williams, et al., 2007).

In addition, healthy food availability is very significant when battling obesity. Decreasing prices of targeted healthy food and beverage selection is an important aspect of the employer's action plan because employees respond well to price and money expenditure (French, et al., 2010).

Another factor to consider is the continuous technology advancement that leads to a decrease in physical activity. More automated jobs bring less caloric expenditure as a result and, therefore the risk for obesity could be affected. Technology limits the

opportunity for physical demands in the workplace. In addition, employers are consistently looking for consistency and efficiency and often automation and latest technology are essential to achieve their goals.

A good idea could be to establish mandatory breaks, 15 minutes during the morning and 15 minutes during the afternoon, to be taken in a designated area for physical breaks or “body shake” break. The designated areas could have elliptic equipment or bikes. Employees could be required to use the equipment as part of their job requirements. Another idea could be the use of exercise pedals for low activity jobs. In this scenario, workers could perform physical activity while working a low activity job, see figure 5.

It would be helpful if the employers could create modifications for the tasks that have been positively associated with obesity, promote prevention programs and incentive that can motivate the employees to develop healthy behaviors and life styles.

## Appendix

**Figure A1: Body Mass Chart (weight x height)**

		Under Weight					Healthy Weight					Overweight				Obese					
BMI	Height																				
	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76		
Weight	4'10 "	4'11 "	5'0 "	5'1" "	5'2" "	5'3" "	5'4 "	5'5 "	5'6" "	5'7" "	5'8 "	5'9" "	5'10 "	5'11 "	6'0" "	6'1" "	6'2" "	6'3" "	6'4" "		
100	21	20	20	19	18	18	17	17	16	16	15	15	14	14	14	13	13	13	12		
105	22	21	21	20	19	18	18	18	17	16	16	16	15	15	14	14	14	13	13		
110	23	22	22	21	20	20	19	18	18	17	17	16	16	15	15	15	14	14	13		
115	24	23	23	22	21	20	20	19	19	18	18	17	17	16	16	15	15	14	14		
120	25	24	23	23	22	21	21	20	19	19	18	18	17	17	16	16	15	15	15		
125	26	25	24	24	23	22	22	21	20	20	19	18	18	17	17	17	16	16	15		
130	27	26	25	25	24	23	22	22	21	20	20	19	19	18	18	17	17	16	16		
135	28	27	26	26	25	24	23	23	22	21	21	20	19	19	18	18	17	17	16		
140	29	28	27	27	26	25	24	23	23	22	21	21	20	20	19	19	18	18	17		
145	30	29	28	27	27	26	25	24	23	23	22	21	21	20	20	19	19	18	18		
150	31	30	29	28	27	27	26	25	24	24	23	22	22	21	20	20	19	19	18		
155	32	31	30	29	28	28	27	26	25	24	24	23	22	22	21	20	20	19	19		
160	33	32	31	30	29	28	28	27	26	25	24	24	23	22	22	21	21	20	20		
165	35	33	32	31	30	29	28	28	27	26	25	24	24	23	22	22	21	21	20		
170	36	34	33	32	31	30	29	28	27	27	26	25	24	24	23	22	22	21	21		
175	37	35	34	33	32	31	30	29	28	27	27	26	25	24	24	23	23	22	21		
180	38	36	35	34	33	32	31	30	29	28	27	27	26	25	24	24	23	23	22		
185	39	37	36	35	34	33	32	31	30	29	28	27	27	26	25	24	24	23	23		
190	40	38	37	36	35	34	33	32	31	30	29	28	27	27	26	25	24	24	23		
195	41	39	38	37	36	35	34	33	32	31	30	29	28	27	27	26	25	24	24		
200	42	40	39	38	37	36	34	33	32	31	30	30	29	28	27	26	26	25	24		
205	43	41	40	39	38	36	35	34	33	32	31	30	29	29	28	27	26	26	25		
210	44	43	41	40	38	37	36	35	34	33	32	31	30	29	29	28	27	26	26		
215	45	44	42	41	39	38	37	36	35	34	33	32	31	30	29	28	28	27	26		
220	46	45	43	42	40	39	38	37	36	35	34	33	32	31	30	29	28	28	27		
225	47	46	44	43	41	40	39	38	36	35	34	33	32	31	31	30	29	28	27		
230	48	47	45	44	42	41	40	38	37	36	35	34	33	32	31	30	30	29	28		
235	49	48	46	44	43	42	40	39	38	37	36	35	34	33	32	31	30	29	29		
240	50	49	47	45	44	43	41	40	39	38	37	36	35	34	33	32	31	30	29		
245	51	50	48	46	45	43	42	41	40	38	37	36	35	34	33	32	32	31	30		

Source: <http://www.wvdhhr.org/bph/oehp/obesity/preval.htm>

**Table A1: Group No. 01**

<b>Officials and administrators public admin</b>	<b>Mean Hourly Wage</b>	<b>Estimated U.S. Employment</b>
Education Administrators, Preschool and Child Care Center/Program	\$ 24.66	49,320
Education Administrators, Elementary and Secondary School	\$ 43.36	222,810
Education Administrators, Postsecondary	\$ 46.72	113,620
Social and Community Service Managers	\$ 30.43	184,530

**Table A2: Group No. 02**

<b>Managers administrators, except public administration</b>	<b>Mean Hourly Wage</b>	<b>Estimated U.S. Employment</b>
Chief Executives	\$ 84.88	267,370
General and Operations Managers	\$ 55.04	1,805,030
Advertising and Promotions Managers	\$ 49.69	30,710
Marketing Managers	\$ 60.67	168,410
Sales Managers	\$ 56.18	328,230
Public Relations Managers	\$ 50.81	53,200
Administrative Services Managers	\$ 41.69	249,600
Computer and Information Systems Managers	\$ 60.41	300,830
Financial Managers, Branch or Department	\$ 57.91	477,690
Human Resources Managers	\$ 52.21	81,750
Compensation and Benefits Managers	\$ 48.62	24,580
Training and Development Managers	\$ 47.73	27,150
Industrial Production Managers	\$ 46.33	151,850
Purchasing Managers	\$ 49.57	66,990
Transportation, Storage and Distribution Managers	\$ 42.23	92,150
Construction Managers	\$ 45.14	195,000
Engineering Managers	\$ 62.19	184,530
Food Service Managers	\$ 25.30	183,940
Funeral Directors	\$ 29.55	29,760
Gaming Managers	\$ 32.32	3,570
Lodging Managers	\$ 26.49	29,870
Medical and Health Services Managers	\$ 46.17	287,560
Natural Sciences Managers	\$ 61.65	47,510
Directors, Religious Activities and Education	\$ 20.04	17,560

Producers, Technical Directors/Managers	\$ 44.34	82,880
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**Table A3: Group No. 03**

Management related occupations	Mean Hourly Wage	Estimated U.S. Employment
Postmasters and Mail Superintendents	\$ 29.85	24,410
Human resources, training and labor relation specialists, all other	\$ 28.31	436,090
Compensation, Benefits, and Job Analysis Specialists	\$ 29.34	94,710
Training and Development Specialists	\$ 28.14	205,680
Logisticians	\$ 35.99	112,310
Management Analysts	\$ 42.30	538,950
Archivists	\$ 24.11	5,460
Curators	\$ 25.74	10,340
Farm and Home Management Advisors	\$ 22.84	10,500

**Table A4: Groups No.4**

Engineers	Mean Hourly Wage	Estimated U.S. Employment
Aerospace Engineers	\$ 49.94	79,400
Agricultural Engineers	\$ 37.69	2,650
Biomedical Engineers	\$ 42.48	16,590
Chemical Engineers	\$ 47.81	27,860
Civil Engineers	\$ 39.76	254,130
Electrical Engineers	\$ 42.88	154,250
Electronics Engineers, Except Computer	\$ 45.51	136,310
Environmental Engineers	\$ 40.07	50,350
Health and Safety Engineers, except mining safety Engineers and inspectors	\$ 37.76	23,170
Industrial Engineers	\$ 38.39	211,490
Marines Engineers and Naval Architects	\$ 44.10	5,470
Materials Engineers	\$ 41.73	22,160
Mechanical Engineers	\$ 40.17	238,260
Mining and Geological Engineers, Including Mining Safety Engineers	\$ 43.30	6,630
Nuclear Engineers	\$ 50.56	18,430
Petroleum Engineers	\$ 66.82	30,880



Airline Pilots, Copilots, and Flight Engineers	\$ 56.76	68,350
Ship Engineers	\$ 35.84	10,010

**Table A5: Group No. 05**

Architects and surveyors	Mean Hourly Wage	Estimated U.S. Employment
Architects, Except Landscape and Naval	\$ 38.13	83,590
Landscape Architects	\$ 31.98	15,760
Cartographers and Photogrammetrists	\$ 28.90	11,240
Surveyors	\$ 28.24	42,020

**Table A6: Group No. 06**

Natural mathematical/computer scientists	Mean Hourly Wage	Estimated U.S. Employment
Computer and Information Scientists, Research	\$ 49.59	25,160
Computer Programmers	\$ 36.54	320,100
Computer Software Developer, Applications	\$ 44.27	539,880
Computer Software Developers, Systems Software	\$ 48.28	387,050
Computer Support Specialists	\$ 24.91	632,490
Computer Systems Analysts	\$ 39.58	487,740
Database Administrators	\$ 37.19	108,500
Network and Computer Systems Administrators	\$ 35.71	341,800
Information Security Analysts, Web Developers, and Computer Network Architects	\$ 39.27	272,670
Actuaries	\$ 49.52	19,590
Mathematicians	\$ 48.71	2,980
Operations Research Analysts	\$ 37.90	65,030
Statisticians	\$ 37.16	23,770
Mathematical Technicians	\$ 24.47	1,060
Computer Hardware Engineers	\$ 48.73	71,990

**Table A7: Group No. 07**

Health diagnosing occupations	Mean Hourly Wage	Estimated U.S. Employment
Chiropractors	\$ 37.88	27,510
Dentists, General	\$ 77.76	90,950
Oral and Maxillofacial Surgeons	\$ 104.51	5,800
Orthodontists	\$ 98.4	5,040
Prosthodontics	\$ 62.89	560
Physician Assistants	\$ 43.01	83,540
Optometrists	\$ 51.79	27,950
Family and General Practitioners	\$ 85.26	101,800
Internists, General	\$ 90.97	46,740
Obstetricians and Gynecologists	\$105.10	20,540
Pediatricians, General	\$ 81.08	29,640
Psychiatrists	\$ 83.73	23,140
Podiatrists	\$ 64.36	9,210
Veterinarians	\$ 43.87	55,410

**Table A8: Group No. 08**

Health assessment/treating occupations	Mean Hourly Wage	Estimated U.S. Employment
Clinical , Counseling and School Psychologists	\$ 35.14	100,850
Industrial-Organizational Psychologists	\$ 59.69	1,230
Sociologists	\$ 38.20	2,830
Substance Abuse and Behavioral Disorder Counselors	\$ 19.73	76,600
Marriage and Family Therapists	\$ 23.42	33,990
Mental Health Counselors	\$ 20.48	114,180
Rehabilitation Counselors	\$ 17.82	110,690
Surgeons	\$ 111.32	42,340
Registered Nurses	\$ 33.23	2,724,570
Audiologists	\$ 34.13	12,490
Occupational Therapists	\$ 36.05	103,570
Physical Therapists	\$ 38.38	185,440
Radiation Therapists	\$ 38.14	18,380
Respiratory Therapists	\$ 27.05	113,980

Speech-Language Pathologists	\$ 34.61	117,210
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**Table A9: Group No. 09**

Teachers, librarians, counselors	Mean Hourly Wage	Estimated U.S. Employment
Educational, Vocational, and School Counselors	\$ 27.18	244,560
Business Teachers, Postsecondary	\$ 41.64	82,090
Computer Science Teachers, Postsecondary	\$ 38.68	33,510
Mathematical Science Teachers, Postsecondary	\$ 35.80	53,650
Architecture Teachers, Postsecondary	\$ 38.27	7,060
Engineering Teachers, Postsecondary	\$ 46.76	33,660
Agricultural Sciences Teachers, Postsecondary	\$ 40.13	10,270
Biological Science Teachers, Postsecondary	\$ 41.76	50,090
Forestry and Conservation Science Teachers, Postsecondary	\$ 39.73	2,520
Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary	\$ 43.92	10,660
Chemistry Teachers, Postsecondary	\$ 38.68	20,830
Environmental Science Teachers, Postsecondary	\$ 40.45	4,990
Physics Teachers, Postsecondary	\$ 41.70	13,630
Anthropology and Archeology Teachers, Postsecondary	\$ 39.36	5,790
Area, Ethnic, and Cultural Studies Teachers, Postsecondary	\$ 38.38	9,250
Economics Teachers, Postsecondary	\$ 45.41	13,300
Geography Teachers, Postsecondary	\$ 34.76	4,280
Political Science Teachers, Postsecondary	\$ 38.93	17,260
Psychology Teachers, Postsecondary	\$ 36.00	37,540
Sociology Teachers, Postsecondary	\$ 35.25	17,250
Health Specialties Teachers, Postsecondary	\$ 47.70	153,430
Nursing Instructors and Teachers, Postsecondary	\$ 32.60	55,930
Education Teachers, Postsecondary	\$ 31.66	63,330
Library Science Teachers, Postsecondary	\$ 35.59	4,410
Criminal Justice and Law Enforcement Teachers, Postsecondary	\$ 31.58	14,630
Law Teachers, Postsecondary	\$ 52.29	14,980
Social Work Teachers, Postsecondary	\$ 34.15	9,970
Art, Drama, and Music Teachers, Postsecondary	\$ 34.93	90,030
Communications Teachers, Postsecondary	\$ 32.48	29,610
English Language and Literature Teachers, Postsecondary	\$ 33.06	72,700

Foreign Language and Literature Teachers, Postsecondary	\$ 32.08	29,010
History Teachers, Postsecondary	\$ 34.71	23,470
Philosophy and Religion Teachers, Postsecondary	\$ 34.43	21,930
Graduate Teaching Assistants	\$ 15.96	110,130
Home Economics Teachers, Postsecondary	\$ 32.73	5,490
Recreation and Fitness Studies Teachers, Postsecondary	\$ 30.68	18,660
Vocational Education Teachers, Postsecondary	\$ 25.71	125,160
Preschool Teachers, Except Special Education	\$ 14.50	349,430
Kindergarten Teachers, Except Special Education	\$ 25.17	164,910
Elementary School Teachers, Except Special Education	\$ 26.57	1,425,590
Middle School Teachers, Except Special and Vocational Education	\$ 26.82	642,820
Vocational Education Teachers, Middle School	\$ 26.97	16,870
Secondary School Teachers, Except Special and Vocational Education	\$ 27.89	1,004,850
Vocational Education Teachers, Secondary School	\$ 27.08	88,210
Special Education Teachers, Preschool, Kindergarten, and Elementary School	\$ 27.14	220,220
Special Education Teachers, Middle School	\$ 28.09	100,590
Special Education Teachers, Secondary School	\$ 28.40	132,960
Adult Literacy, Remedial Education, and GED Teachers and Instructors	\$ 24.69	67,770
Self-Enrichment Education Teachers	\$ 19.75	169,200
Librarians	\$ 27.41	145,710
Teacher Assistants	\$ 12.14	1,214,090

**Table A10: Group No. 10**

Writers, artists, entertainers, athletes	Mean Hourly Wage	Estimated U.S. Employment
Court Reporters	\$ 25.82	18,440
Art Directors	\$ 45.92	30,680
Craft Artists	\$ 15.51	4,810
Fine Artists, Including Painters, Sculptors, and Illustrators	\$ 25.67	11,830
Multi-Media Artists and Animators	\$ 32.72	28,400
Commercial and Industrial Designers	\$ 30.56	28,710
Fashion Designers	\$ 35.54	16,010
Floral Designers	\$ 12.19	47,180
Graphic Designers	\$ 23.41	191,550

Interior Designers	\$ 25.39	40,950
Merchandise Displayers and Window Trimmers	\$ 13.70	67,290
Set and Exhibit Designers	\$ 26.39	8,510
Actors	\$ 33.82	60,830
Producers, Technical Directors/Managers	\$ 44.34	82,880
Athletes and Sports Competitors	\$ 38.38	12,630
Coaches and Scouts	\$ 17.47	193,810
Umpires, Referees, and Other Sports Officials	\$ 14.25	15,630
Dancers	\$ 19.53	11,240
directors- Stage, Motion Pictures, Television, and Radio	\$ 21.23	10,870
Music Director and Composers	\$ 25.84	25,290
Musicians and singers	\$ 31.74	42,530
Radio and Television Announcers	\$ 19.47	31,630
Public Address System and Other Announcers	\$ 19.17	7,770
Broadcast News Analysts	\$ 36.71	5,200
Reporters and Correspondents	\$ 20.98	45,270
Public Relations Specialists	\$ 29.04	212,510
Editors	\$ 29.08	98,990
Poets, Lyricists and Creative Writers	\$ 32.72	40,930
Interpreters and Translators	\$ 24.33	47,950
Audio and Video Equipment Technicians	\$ 22.12	49,180
Broadcast Technicians	\$ 20.41	30,360
Radio Operators	\$ 21.73	1,220
Sound Engineering Technicians	\$ 26.98	14,930
Photographers	\$ 17.59	54,410
Camera Operators, Television, Video, and Motion Picture	\$ 23.77	16,270
Film and Video Editors	\$ 32.06	20,730
Motion Picture Projectionists	\$ 10.67	8,890
Models	\$ 13.38	2,760

**Table A11: Group No. 11**

Other professional specialty occupations	Mean Hourly Wage	Estimated U.S. Employment
Animal Scientists	\$ 35.66	2,190
Biologists	\$ 35.12	31,550
Biochemists and Biophysicists	\$ 42.13	25,160

Microbiologists	\$ 34.48	17,660
Epidemiologists	\$ 33.49	4,610
Astronomers	\$ 48.86	2,080
Physicists	\$ 53.89	16,220
Atmospheric and Space Scientists	\$ 43.68	9,640
Chemists	\$ 35.95	80,040
Materials Scientists	\$ 41.64	7,900
Environmental Scientists and Specialists, Including Health	\$ 33.08	83,090
Geoscientists, Except Hydrologists and Geographers	\$ 46.97	32,490
Hydrologists	\$ 38.01	6,960
Survey Researchers	\$ 22.95	17,060
Urban and Regional Planners	\$ 32.38	38,320
Anthropologists and Archeologists	\$ 28.39	5,370
Geographers	\$ 35.66	1,430
Historians	\$ 27.70	3,190
Political Scientists	\$ 50.50	5,340
Child, Family, and School Social Workers	\$ 21.35	276,510
Medical and Public Health Social Workers	\$ 24.28	133,890
Mental Health and Substance Abuse Social Workers	\$ 20.50	115,390
Social and Human Service Assistants	\$ 14.77	359,860
Instructional Coordinators	\$ 29.67	130,230

**Table A12: Group No. 12**

Health technologists/technicians	Mean Hourly Wage	Estimated U.S. Employment
Medical Scientists, Except Epidemiologists	\$ 42.13	95,220
Forensic Science Technicians	\$ 26.76	12,560
Medical and Clinical Laboratory Technologists	\$ 27.94	165,220
Medical and Clinical Laboratory Technicians	\$ 18.73	156,860
Cardiovascular Technologists and Technicians	\$ 25.08	50,410
Diagnostic Medical Sonographers	\$ 31.63	54,760
Nuclear Medicine Technologists	\$ 33.64	21,200
Radiologic Technologists and technicians	\$ 27.29	220,540
Emergency Medical Technicians and Paramedics	\$ 16.36	229,340
Dietetic Technicians	\$ 14.04	23,490
Pharmacy Technicians	\$ 14.43	343,550

Psychiatric Technicians	\$ 15.08	69,840
Respiratory Therapy Technicians	\$ 22.76	13,940
Surgical Technologists	\$ 20.41	94,490
Veterinary Technologists and Technicians	\$ 15.18	78,800
Medical Records and Health Information Technicians	\$ 17.27	180,280
Occupational Health and Safety Technicians	\$ 23.19	11,090
Medical Equipment Preparers	\$ 14.99	49,560
Pharmacy Aides	\$ 11.23	45,130
Veterinary Assistants and Laboratory Animal Caretakers	\$ 11.75	72,530
Dental Laboratory Technicians	\$ 18.54	37,600
Medical Appliance Technicians	\$ 18.12	13,390
Ophthalmic Laboratory Technicians	\$ 14.38	27,630

**Table A13: Group No. 13**

<b>Technologists, technicians except health</b>	<b>Mean Hourly Wage</b>	<b>Estimated U.S. Employment</b>
Architectural and civil Drafters	\$ 24.11	85,740
Electronic and electrical Drafters	\$ 27.52	28,010
Mechanical Drafters	\$ 25.07	64,090
Aerospace Engineering and Operations Technicians	\$ 29.93	9,290
Civil Engineering Technicians	\$ 23.31	71,890
Electronics and electrical Engineering Technicians	\$ 27.52	150,020
Electro-Mechanical Technicians	\$ 25.42	16,620
Environmental Engineering Technicians	\$ 23.51	19,490
Industrial Engineering Technicians	\$ 24.93	63,030
Mechanical Engineering Technicians	\$ 25.39	44,760
Surveying and mapping Technicians	\$ 20.22	48,590
Biological Technicians	\$ 20.33	72,140
Chemical Technicians	\$ 21.42	59,650
Geophysical Data and sample test Technicians	\$ 27.81	14,680
Nuclear Technicians	\$ 32.46	7,370
Environmental Science and Protection Technicians, Including Health	\$ 21.76	30,320
Museum Technicians and Conservators	\$ 20.41	10,470
Audio-Visual Collections Specialists	\$ 22.59	8,800
Library Technicians	\$ 15.42	106,560
Traffic Technicians	\$ 21.54	6,280

**Table A14: Group No. 14**

<b>Supervisors and proprietors</b>	<b>Mean Hourly Wage</b>	<b>Estimated U.S. Employment</b>
First-Line Supervisors/Managers of Correctional Officers	\$ 28.26	58,780
First-Line Supervisors/Managers of Police and Detectives	\$ 39.06	102,040
First-Line Supervisors of Fire Fighting and Prevention Workers	\$ 34.62	58,210
First-Line Supervisors/Managers of Food Preparation and Serving Workers	\$ 15.39	787,540
First-Line Supervisors/Managers of Housekeeping and Janitorial Workers	\$ 18.16	171,960
First-Line Supervisors/Managers of Landscaping, Lawn Service, and Grounds keeping Workers	\$ 21.71	100,460
Gaming Supervisors	\$ 23.82	23,080
Slot Key Persons	\$ 15.18	8,570
First-Line Supervisors/Managers of Personal Service Workers	\$ 18.50	136,520
First-Line Supervisors/Managers of Retail Sales Workers	\$ 19.53	1,197,390
First-Line Supervisors/Managers of Non-Retail Sales Workers	\$ 39.62	235,630
First-Line Supervisors/Managers of Office and Administrative Support Workers	\$ 25.16	1,364,720
First-Line Supervisors/Managers of Construction Trades and Extraction Workers	\$ 30.25	459,830
First-Line Supervisors/Managers of Mechanics, Installers, and Repairers	\$ 29.90	418,530
First-Line Supervisors/Managers of Production and Operating Workers	\$ 27.35	559,350
Aircraft Cargo Handling Supervisors	\$ 24.28	6,710
First-Line Supervisors/Managers of Helpers, Laborers, and Material Movers, Hand	\$ 22.52	166,560
First-Line Supervisors/Managers of Transportation and Material-Moving Machine and Vehicle Operators	\$ 26.54	198,690

**Table A15: Group No. 15**

<b>Sales representatives, commodities and finance</b>	<b>Mean Hourly Wage</b>	<b>Estimated U.S. Employment</b>
Property, Real Estate, and Community Association Managers	\$ 30.36	152,380
Agents and Business Managers of Artists, Performers, and Athletes	\$ 44.35	11,950
Purchasing Agents and Buyers, Farm Products	\$ 29.08	10,180
Wholesale and Retail Buyers, Except Farm Products	\$ 27.31	105,610
Purchasing Agents, Except Wholesale, Retail, and Farm Products	\$ 29.46	274,540



Parts Salespersons	\$ 15.38	208,800
Retail Salespersons	\$ 12.08	4,270,550
Advertising Sales Agents	\$ 26.65	144,760
Insurance Sales Agents	\$ 30.28	321,780
Sales Agents, Financial Services, Securities and Commodities	\$ 47.50	307,020
Travel Agents	\$ 17.18	67,490
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	\$ 41.23	375,500
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	\$ 30.54	1,390,480
Demonstrators and Product Promoters	\$ 13.66	72,620
Real Estate Brokers	\$ 40.31	38,200
Real Estate Sales Agents	\$ 24.60	158,340
Sales Engineers	\$ 46.79	65,580
Telemarketers	\$ 12.46	258,060
Door-To-Door Sales Workers, News and Street Vendors, and Related Workers	\$ 13.27	6,910

**Table A16: Group No. 16**

Other sales	Mean Hourly Wage	Estimated U.S. Employment
Insurance Adjusters, Examiners, and Investigators	\$ 29.38	263,810
Insurance Appraisers, Auto Damage	\$ 28.41	10,950
Gaming Dealers	\$ 10.54	88,370
Gaming and Sports Book Writers and Runners	\$ 11.65	12,800
Cashiers	\$ 21.66	6,360
Gaming Change Persons and Booth Cashiers	\$ 11.83	30,940
Counter and Rental Clerks	\$ 12.75	420,070
Switchboard Operators, Including Answering Service	\$ 12.84	132,680
Telephone Operators	\$ 16.48	14,890
Bill and Account Collectors	\$ 16.24	390,800
Billing and Posting Clerks	\$ 16.31	485,820
Reservation and Transportation Ticket Agents and Travel Clerks	\$ 16.19	126,790
Parking Lot Attendants	\$ 10.38	126,160

**Table A17: Group No. 17**

<b>Computer equipment operators</b>	<b>Mean Hourly Wage</b>	<b>Estimated U.S. Employment</b>
Computer Occupations, All others	\$ 38.70	177,630

**Table A18: Group No. 18**

<b>Secretaries, stenographers and typists</b>	<b>Mean Hourly Wage</b>	<b>Estimated U.S. Employment</b>
Social Science Research Assistants	\$ 20.39	26,200
Paralegals and Legal Assistants	\$ 24.02	252,250
Title Examiners, Abstractors, and Searchers	\$ 21.56	49,760
Technical Writers	\$ 32.35	45,120
Copy Writers and Authors	\$ 32.72	40,930
Medical Transcriptionists	\$ 16.37	76,570
Executive Secretaries and Administrative Assistants	\$ 23.13	952,030
Legal Secretaries	\$ 21.30	220,680
Medical Secretaries	\$ 15.59	502,850
Secretaries, Except Legal, Medical, and Executive	\$ 15.87	1,955,570
Computer Operators	\$ 18.89	77,280
Data Entry Keyer	\$ 13.95	211,200
Word Processors and Typists	\$ 16.94	96,330
Desktop Publishers	\$ 18.77	18,620
Insurance Claims and Policy Processing Clerks	\$ 17.72	218,630
Office Clerks, General	\$ 13.90	2,828,140
Statistical Assistants	\$ 19.49	14,780

**Table A19: Group No. 19**

<b>Financial records processing occupations</b>	<b>Mean Hourly Wage</b>	<b>Estimated U.S. Employment</b>
Cost Estimators	\$ 30.13	187,730
Accountants and auditor	\$ 33.72	1,085,150
Appraiser and Assessors of Real State	\$ 26.18	60,930
Budget Analysts	\$ 34.35	57,110
Credit Analysts	\$ 33.48	59,140

Financial Analysts	\$ 42.18	226,340
Personal Financial Advisors	\$ 43.70	161,790
Insurance Underwriters	\$ 32.46	92,890
Financial Examiners	\$ 40.20	28,050
Loan Counselors	\$ 20.16	29,400
Loan Officers	\$ 32.67	284,530
Tax Examiners, Collectors, and Revenue Agents	\$ 26.67	67,970
Tax Preparers	\$ 18.95	59,180
Economists	\$ 48.20	14,270
Market Research Analysts and market specialist	\$ 32.27	318,190
Bookkeeping, Accounting, and Auditing Clerks	\$ 17.37	1,643,470
Gaming Cage Workers	\$ 12.82	15,690
Payroll and Timekeeping Clerks	\$ 18.31	176,320
Procurement Clerks	\$ 18.24	70,540
Tellers	\$ 12.27	544,150
Brokerage Clerks	\$ 21.06	60,720

**Table A20: Group No. 20**

Mail and message distributing	Mean Hourly Wage	Estimated U.S. Employment
Correspondence Clerks	\$ 17.04	8,680
Postal Service Clerks	\$ 25.41	65,040
Postal Service Mail Carriers	\$ 24.71	315,330
Postal Service Mail Sorters, Processors, and Processing Machine Operators	\$ 23.26	139,700
Mail Clerks and Mail Machine Operators, Except Postal Service	\$ 13.47	115,010

**Table A21: Group No. 21**

Other administrative support	Mean Hourly Wage	Estimated U.S. Employment
Meeting and Convention Planners	\$ 23.46	64,020
Clergy	\$ 23.31	42,560
Hosts and Hostesses, Restaurant, Lounge, and Coffee Shop	\$ 9.45	329,070
Ushers, Lobby Attendants, and Ticket Takers	\$ 9.69	105,560
Amusement and Recreation Attendants	\$ 9.60	253,110

Costume Attendants	\$ 19.52	5,460
Locker Room, Coatroom, and Dressing Room Attendants	\$ 10.35	18,410
Funeral Attendants	\$ 11.83	30,940
Court, Municipal, and License Clerks	\$ 17.50	121,290
Credit Authorizers, Checkers, and Clerks	\$ 17.21	51,240
Customer Service Representatives	\$ 15.92	2,212,820
Eligibility Interviewers, Government Programs	\$ 19.95	120,610
File Clerks	\$ 13.20	165,250
Hotel, Motel, and Resort Desk Clerks	\$ 10.46	224,430
Interviewers, Except Eligibility and Loan	\$ 14.91	200,150
Library Assistants, Clerical	\$ 12.30	109,440
Loan Interviewers and Clerks	\$ 17.21	186,240
New Accounts Clerks	\$ 15.56	60,830
Order Clerks	\$ 14.76	215,390
Human Resources Assistants, Except Payroll and Timekeeping	\$ 18.43	145,780
Receptionists and Information Clerks	\$ 12.85	973,800
Office Machine Operators, Except Computer	\$ 14.03	66,280
Proofreaders and Copy Markers	\$ 16.47	11,270

**Table A22: Group No. 22**

Private household occupations	Mean Hourly Wage	Estimated U.S. Employment
Maids and Housekeeping Cleaners	\$ 10.31	877,980
Recreation Workers	\$ 12.18	301,840
Residential Advisors	\$ 12.72	76,450
Meter Readers, Utilities	\$ 18.17	40,630

**Table A23: Group No. 23**

Police and firefighters	Mean Hourly Wage	Estimated U.S. Employment
Firefighters	\$ 22.94	304,080
Correctional Officers and Jailers	\$ 20.82	448,740
Detectives and Criminal Investigators	\$ 36.41	111,930
Police and Sheriff's Patrol Officers	\$ 27.05	636,410

Transit and Railroad Police	\$ 28.16	3,890
Police, Fire, and Ambulance Dispatchers	\$ 18.01	97,100
Dispatchers, Except Police, Fire, and Ambulance	\$ 18.23	182,310

**Table A24: Group No. 24**

Other protective service occupations	Mean Hourly Wage	Estimated U.S. Employment
Compliance Officer	\$ 30.66	210,510
Emergency Management Specialists	\$ 27.36	13,060
Probation Officers and Correctional Treatment Specialists	\$ 25.05	88,520
Lawyers	\$ 62.74	570,950
Administrative Law Judges, Adjudicators, and Hearing Officers	\$ 42.47	14,460
Arbitrators, Mediators, and Conciliators	\$ 36.32	6,880
Judges, Magistrate Judges, and Magistrates	\$ 53.34	26,570
Fire inspectors and investigators	\$ 27.45	12,560
Forest Fire Inspectors and Prevention Specialists	\$ 18.99	1,530
Bailiffs	\$ 19.79	126,730
Fish and Game Wardens	\$ 26.77	7,180
Parking Enforcement Workers	\$ 17.35	9,310
Animal Control Workers	\$ 16.54	14,960
Private Detectives and Investigators	\$ 23.37	26,080
Gaming Surveillance Officers and Gaming Investigators	\$ 15.97	7,580
Security Guards	\$ 13.00	1,032,940
Crossing Guards	\$ 12.44	68,520
Lifeguards, Ski Patrol, and Other Recreational Protective Service Workers	\$ 10.02	123,140

**Table A25: Group No. 25**

Food service	Mean Hourly Wage	Estimated U.S. Employment
Food Scientists and Technologists	\$ 30.85	12,040
Agricultural and Food Science Technicians	\$ 17.38	17,150
Chefs and Head Cooks	\$ 22.40	90,300
Cooks, Fast Food	\$ 9.00	502,450
Cooks, Institution and Cafeteria	\$ 11.65	396,970

Cooks, Private Household	\$ 14.94	370
Cooks, Restaurant	\$ 11.25	947,060
Cooks, Short Order	\$ 10.23	168,320
Food Preparation Workers	\$ 10.07	775,140
Bartenders	\$ 10.36	512,230
Combined Food Preparation and Serving Workers, Including Fast Food	\$ 9.03	2,799,430
Counter Attendants, Cafeteria, Food Concession, and Coffee Shop	\$ 9.35	441,830
Waiters and Waitresses	\$ 10.05	2,289,010
Food Servers, Non-restaurant	\$ 10.52	221,000
Dining Room and Cafeteria Attendants and Bartender Helpers	\$ 9.40	391,290
Dishwashers	\$ 9.06	504,280
Bakers	\$ 12.10	149,910
Butchers and Meat Cutters	\$ 14.43	130,720
Meat, Poultry, and Fish Cutters and Trimmers	\$ 11.44	164,650
Slaughterers and Meat Packers	\$ 11.63	80,110
Food and Tobacco Roasting, Baking, and Drying Machine Operators and Tenders	\$ 14.01	18,890
Food Batch-makers	\$ 13.26	100,210
Food Cooking Machine Operators and Tenders	\$ 12.89	31,020

**Table A26: Group No. 26**

Health service	Mean Hourly Wage	Estimated U.S. Employment
Health Educators	\$ 25.10	56,610
Dietitians and Nutritionists	\$ 26.66	56,130
Pharmacists	\$ 53.92	272,320
Anesthesiologists	\$ 112.96	33,310
Recreational Therapists	\$ 20.65	19,650
Dental Hygienists	\$ 33.54	184,110
Licensed Practical and Licensed Vocational Nurses	\$ 20.21	729,140
Opticians, Dispensing	\$ 16.70	60,680
Orthotics and Prosthetics	\$ 34.13	6,860
Occupational Health and Safety Specialists	\$ 32.37	57,950
Nursing Aides, Orderlies, and Attendants	\$ 12.22	1,466,700
Psychiatric Aides	\$ 13.11	71,570
Occupational Therapist Assistants	\$ 25.07	29,130

Occupational Therapist Aides	\$ 15.28	7,090
Physical Therapist Assistants	\$ 24.57	67,550
Physical Therapist Aides	\$ 12.11	47,640
Massage Therapists	\$ 19.19	63,810
Dental Assistants	\$ 16.70	296,810
Medical Assistants	\$ 14.51	539,220

**Table A27: Group No. 27**

Cleaning and building service	Mean Hourly Wage	Estimated U.S. Employment
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	\$ 11.94	2,068,460
Pest Control Workers	\$ 15.65	62,270
Landscaping and Grounds keeping Workers	\$ 12.33	821,750
Pesticide Handlers, Sprayers, and Applicators, Vegetation	\$ 15.24	23,540
Tree Trimmers and Pruners	\$ 15.85	38,530
Hazardous Materials Removal Workers	\$ 20.07	36,270
Cleaners of Vehicles and Equipment	\$ 10.87	290,780

**Table A28: Group No. 28**

Personal service	Mean Hourly Wage	Estimated U.S. Employment
Athletic Trainers	\$ 21.46	18,240
Home Health Aides	\$ 10.49	924,650
Embalmers	\$ 21.66	6,360
Barbers	\$ 13.49	10,430
Hairdressers, Hairstylists, and Cosmetologists	\$ 12.72	357,030
Makeup Artists, Theatrical and Performance	\$ 30.63	2,040
Manicurists and Pedicurists	\$ 10.46	56,270
Shampooers	\$ 9.20	13,240
Skin Care Specialists	\$ 15.42	31,450
Baggage Porters and Bellhops	\$ 11.49	44,130
Concierges	\$ 13.96	22,650
Tour Guides and Escorts	\$ 12.82	30,730
Travel Guides	\$ 15.91	4,110

Flight Attendants	\$ 20.06	87,190
Transportation Attendants, Except Flight Attendants and Baggage Porters	\$ 11.64	27,040
Child Care Workers	\$ 10.25	631,240
Personal and Home Care Aides	\$ 9.88	820,600
Fitness Trainers and Aerobics Instructors	\$ 17.88	231,500
Recreation Workers	\$ 12.18	301,840

**Table A29: Group No. 29**

<b>Farm operators and managers</b>	<b>Mean Hourly Wage</b>	<b>Estimated U.S. Employment</b>
Farmers, ranchers and other agricultural managers	\$ 33.66	3,340
Farmers and Ranchers	\$ 20.43	340
First-Line Supervisors of Farming, Fishing, and Forestry Workers	\$ 21.97	18,920

**Table A30: Group No. 30**

<b>Farm workers and other agricultural workers</b>	<b>Mean Hourly Wage</b>	<b>Estimated U.S. Employment</b>
Animal Trainers	\$ 14.67	10,530
Farm Labor Contractors	\$ 17.17	960
Agricultural Inspectors	\$ 20.25	13,780
Animal Breeders	\$ 18.11	1,460
Graders and Sorters, Agricultural Products	\$ 9.95	40,970
Agricultural Equipment Operators	\$ 12.90	22,680
Farmers and laborers, crop, nursery and greenhouse	\$ 9.62	233,280
Farmworkers, Farm and Ranch Animals	\$ 11.60	29,790

**Table A31: Group No. 31**

<b>Forestry and fishing occupations</b>	<b>Mean Hourly Wage</b>	<b>Estimated U.S. Employment</b>
Soil and Plant Scientists	\$ 30.72	11,860
Zoologists and Wildlife Biologists	\$ 29.75	18,380
Conservation Scientists	\$ 29.95	18,910



Foresters	\$ 26.99	9,000
Forest and Conservation Technicians	\$ 18.01	30,620
Nonfarm Animal Caretakers	\$ 10.58	144,240
Fishers and Related Fishing Workers	\$ 14.53	640
Forest and Conservation Workers	\$ 13.07	8,250
Fallers	\$ 20.49	5,020
Log Graders and Scalpers	\$ 16.11	2,810

**Table A32: Group No. 32**

<b>Mechanics and repairers</b>	<b>Mean Hourly Wage</b>	<b>Estimated U.S. Employment</b>
Boilermakers	\$ 27.23	18,850
Elevator Installers and Repairers	\$ 35.37	20,440
Roustabouts, Oil and Gas	\$ 16.67	51,540
Computer, Automated Teller, and Office Machine Repairers	\$ 18.44	111,690
Electric Motor, Power Tool, and Related Repairers	\$ 18.30	18,710
Electrical and Electronics Installers and Repairers, Transportation Equipment	\$ 25.04	14,410
Electrical and Electronics Repairers, Commercial and Industrial Equipment	\$ 25.20	67,220
Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	\$ 31.71	23,850
Electronic Equipment Installers and Repairers, Motor Vehicles	\$ 15.81	13,610
Aircraft Mechanics and Service Technicians	\$ 26.20	117,320
Automotive Body and Related Repairers	\$ 19.99	131,040
Automotive Glass Installers and Repairers	\$ 16.52	13,690
Automotive Service Technicians and Mechanics	\$ 18.54	589,750
Bus and Truck Mechanics and Diesel Engine Specialists	\$ 20.63	222,940
Farm Equipment Mechanics	\$ 16.92	32,100
Mobile Heavy Equipment Mechanics, Except Engines	\$ 22.48	109,810
Rail Car Repairers	\$ 22.50	19,480
Motorboat Mechanics	\$ 17.87	16,770
Motorcycle Mechanics	\$ 16.44	15,010
Outdoor Power Equipment and Other Small Engine Mechanics	\$ 15.06	26,610
Bicycle Repairers	\$ 11.76	9,950
Recreational Vehicle Service Technicians	\$ 17.26	10,110
Tire Repairers and Changers	\$ 12.19	94,740

Mechanical Door Repairers	\$ 18.71	14,620
Control and Valve Installers and Repairers, Except Mechanical Door	\$ 24.4	42,450
Heating, Air Conditioning and Refrigeration Mechanics and Installers	\$ 21.89	231,160
Home Appliance Repairers	\$ 17.97	34,770
Industrial Machinery Mechanics	\$ 23.09	292,470
Maintenance and Repair Workers, General	\$ 17.75	1,225,450
Maintenance Workers, Machinery	\$ 19.77	77,980
Refractory Materials Repairers, Except Brick masons	\$ 21.57	2,040
Electrical Power-Line Installers and Repairers	\$ 28.58	105,570
Telecommunications Line Installers and Repairers	\$ 24.58	148,930
Coin, Vending, and Amusement Machine Servicers and Repairers	\$ 15.58	36,940
Locksmiths and Safe Repairers	\$ 18.50	16,200
Signal and Track Switch Repairers	\$ 26.06	8,300
Helpers--Installation, Maintenance, and Repair Workers	\$ 12.78	122,820
Automotive and Watercraft Service Attendants	\$ 10.33	102,090

**Table A33: Group No. 33**

Construction and extractive trades	Mean Hourly Wage	Estimated U.S. Employment
Explosives Workers, Ordnance Handling Experts, and Blasters	\$ 22.62	5,210
Continuous Mining Machine Operators	\$ 23.88	12,280
Rock Splitters, Quarry	\$ 16.31	3,600
Roof Bolters, Mining	\$ 25.52	6,060
Helpers--Extraction Workers	\$ 17.36	23,970

**Table A34: Group No. 34**

Precision production occupations	Mean Hourly Wage	Estimated U.S. Employment
Production, Planning, and Expediting Clerks	\$ 21.59	272,910
Radio, Cellular and tower Equipment Installers and Repairs	\$ 21.27	12,920
Telecommunications Equipment Installers and Repairers, Except Line Installers	\$ 25.42	199,240
Avionics Technicians	\$ 26.15	17,070
Camera and Photographic Equipment Repairers	\$ 20.07	2,650

Medical Equipment Repairers	\$ 22.60	34,710
Musical Instrument Repairers and Tuners	\$ 16.27	6,850
Watch Repairers	\$ 19.51	2,480
Fabric Menders, Except Garment	\$ 14.22	760
Computer-Controlled Machine Tool Operators, Metal and Plastic	\$ 17.56	128,870
Numerical Tool and Process Control Programmers	\$ 23.30	20,370
Bookbinders	\$ 13.25	7,500
Job Printers	\$ 14.93	55,210
Prepress Technicians and Workers	\$ 18.69	43,430
Printing Press Operators	\$ 17.19	179,220
Laundry and Dry-Cleaning Workers	\$ 10.28	201,180
Pressers, Textile, Garment, and Related Materials	\$ 9.87	52,790
Sewing Machine Operators	\$ 11.10	142,860
Shoe and Leather Workers and Repairers	\$ 12.35	5,360
Shoe Machine Operators and Tenders	\$ 12.75	3,510
Sewers, Hand	\$ 12.30	5,460
Tailors, Dressmakers, and Custom Sewers	\$ 13.85	25,530
Textile Bleaching and Dyeing Machine Operators and Tenders	\$ 12.01	11,870
Textile Cutting Machine Setters, Operators, and Tenders	\$ 12.20	15,980
Textile Knitting and Weaving Machine Setters, Operators, and Tenders	\$ 12.86	21,160
Textile Winding, Twisting, and Drawing Out Machine Setters, Operators, and Tenders	\$ 12.72	27,400
Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers	\$ 15.43	16,050
Fabric and Apparel Patternmakers	\$ 21.47	6,410
Upholsterers	\$ 15.21	28,260
Cutters and Trimmers, Hand	\$ 12.75	14,670
Jewelers and Precious Stone and Metal Workers	\$ 18.37	21,640
Painters, Transportation Equipment	\$ 20.69	44,730
Painting, Coating, and Decorating Workers	\$ 13.21	19,370
Photographic Process Workers and Processing Machine Operator	\$ 12.39	50,570
Etchers and Engravers	\$ 14.48	8,260
Molders, Shapers, and Casters, Except Metal and Plastic	\$ 14.70	30,600

**Table A35: Group No. 35**

<b>Machine operators/tenderers, except precision</b>	<b>Mean Hourly Wage</b>	<b>Estimated U.S. Employment</b>
Paving, Surfacing, and Tamping Equipment Operators	\$ 18.99	54,120
Pile-Driver Operators	\$ 25.07	3,830
Operating Engineers and Other Construction Equipment Operators	\$ 21.98	335,410
Derrick Operators, Oil and Gas	\$ 22.66	19,480
Rotary Drill Operators, Oil and Gas	\$ 28.15	21,650
Service Unit Operators, Oil, Gas, and Mining	\$ 21.48	46,880
Earth Drillers, Except Oil and Gas	\$ 20.62	17,020
Mine Cutting and Channeling Machine Operators	\$ 22.58	5,850
Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	\$ 16.40	75,170
Forging Machine Setters, Operators, and Tenders, Metal and Plastic	\$ 16.77	21,790
Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	\$ 18.16	35,180
Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	\$ 14.97	181,160
Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic	\$ 17.02	21,560
Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	\$ 15.79	70,450
Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic	\$ 17.89	39,930
Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic	\$ 18.03	21,700
Machinists	\$ 19.48	368,510
Metal-Refining Furnace Operators and Tenders	\$ 19.27	18,080
Pourers and Casters, Metal	\$ 17.08	11,070
Model Makers, Metal and Plastic	\$ 22.34	5,780
Patternmakers, Metal and Plastic	\$ 19.94	4,290
Foundry Mold and Core-makers	\$ 15.28	11,680
Molding, Core-making, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	\$ 14.61	118,300
Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	\$ 16.61	77,290
Tool and Die Makers	\$ 23.16	70,320
Welders, Cutters, Solderers and Braziers	\$ 18.23	316,290
Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	\$ 17.36	40,350
Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	\$ 16.89	20,770

Lay-Out Workers, Metal and Plastic	\$ 19.23	9,600
Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	\$ 15.36	31,150
Tool Grinders, Filers, and Sharpeners	\$ 17.15	11,860
Bindery Workers	\$ 11.37	93,240
Sawing Machine Setters, Operators, and Tenders, Wood	\$ 13.19	37,620
Woodworking Machine Setters, Operators, and Tenders, Except Sawing	\$ 13.54	58,730
Nuclear Power Reactor Operators	\$ 37.28	6,240
Power Distributors and Dispatchers	\$ 34.79	11,600
Power Plant Operators	\$ 30.97	39,980
Stationary Engineers and Boiler Operators	\$ 25.87	34,580
Water and Liquid Waste Treatment Plant and System Operators	\$ 20.93	109,190
Chemical Plant and System Operators	\$ 26.40	40,580
Gas Plant Operators	\$ 28.78	11,750
Petroleum Pump System Operators, Refinery Operators, and Gaugers	\$ 28.99	41,570
Chemical Equipment Operators and Tenders	\$ 22.33	49,020
Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and	\$ 18.70	39,660
Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders	\$ 16.21	31,540
Grinding and Polishing Workers, Hand	\$ 13.80	27,630
Mixing and Blending Machine Setters, Operators, and Tenders	\$ 16.80	118,700
Cutting and Slicing Machine Setters, Operators, and Tenders	\$ 15.27	59,430
Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	\$ 15.85	66,330
Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders	\$ 17.63	18,940
Packaging and Filling Machine Operators and Tenders	\$ 13.44	354,810
Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	\$ 15.10	77,090
Semiconductor Processors	\$ 16.45	22,070
Adhesive Bonding Machine Operator and Tenders	\$ 14.90	16,040
Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders	\$ 13.67	16,430
Cooling and Freezing Equipment Operators and Tenders	\$ 14.93	8,080
Paper Goods Machine Setters, Operators, and Tenders	\$ 16.89	93,290
Tire Builders	\$ 18.92	16,690
Bridge and Lock Tenders	\$ 20.90	3,420
Machine Feeders and Off-bearers	\$ 13.67	110,950
Gas Compressor and Gas Pumping Station Operators	\$ 25.52	3,870

Pump Operators, Except Wellhead Pumpers	\$ 22.31	12,150
Wellhead Pumpers	\$ 20.23	13,190

**Table A36: Group No. 36**

<b>Fabricators, assemblers, inspectors, samplers</b>	<b>Mean Hourly Wage</b>	<b>Estimated U.S. Employment</b>
Construction and Building Inspectors	\$ 26.43	89,620
Fence Erectors	\$ 15.31	21,000
Electronic Home Entertainment Equipment Installers and Repairers	\$ 17.48	27,580
Security and Fire Alarm Systems Installers	\$ 20.24	56,330
Millwrights	\$ 24.35	37,730
Manufactured Building and Mobile Home Installers	\$ 14.59	4,320
Riggers	\$ 21.39	13,750
Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	\$ 23.23	36,570
Coil Winders, Tapers, and Finishers	\$ 14.98	13,670
Electrical and Electronic Equipment Assemblers	\$ 15.04	187,920
Electromechanical Equipment Assemblers	\$ 15.77	50,320
Engine and Other Machine Assemblers	\$ 18.86	36,670
Structural Metal Fabricators and Fitters	\$ 17.63	76,050
Fiberglass Laminators and Fabricators	\$ 14.16	19,070
Team Assemblers	\$ 14.30	952,300
Timing Device Assemblers, Adjusters, and Calibrators	\$ 15.20	1,000
Cabinetmakers and Bench Carpenters	\$ 15.49	81,260
Furniture Finishers	\$ 14.29	14,850
Model Makers, Wood	\$ 16.79	1,370
Patternmakers, Wood	\$ 19.54	820
Inspectors, Testers, Sorters, Samplers, and Weighters	\$ 17.64	434,170
Transportation Inspector	\$ 31.62	24,810

**Table A37: Group No. 37**

<b>Motor vehicle operators</b>	<b>Mean Hourly Wage</b>	<b>Estimated U.S. Employment</b>
Commercial Divers	\$ 28.19	3,760
Ambulance Drivers and Attendants, Except Emergency Medical Technicians	\$ 11.68	18,080

Bus Drivers, Transit and Intercity	\$ 18.00	176,190
Bus Drivers, School	\$ 14.05	477,400
Driver/Sales Workers	\$ 13.22	387,950
Truck Drivers, Heavy and Tractor-Trailer	\$ 19.15	1,508,620
Truck Drivers, Light or Delivery Services	\$ 15.92	771,210
Taxi Drivers and Chauffeurs	\$ 12.03	166,890
Locomotive Engineers	\$ 25.45	38,790
Locomotive Firers	\$ 23.47	1,670
Refuse and Recyclable Material Collectors	\$ 16.55	123,160
Shuttle Car Operators	\$ 24.50	3,080

**Table A38: Group No. 38**

Other transportation, except motor vehicles	Mean Hourly Wage	Estimated U.S. Employment
Commercial Pilots	\$ 36.56	31,630
Air Traffic Controllers	\$ 55.03	23,580
Airfield Operations Specialists	\$ 23.90	6,060
Rail Yard Engineers, Dinkey Operators, and Hostlers	\$ 20.93	5,060
Railroad Brake, Signal, and Switch Operators	\$ 23.61	23,830
Railroad Conductors and Yardmasters	\$ 27.03	44,280
Subway and Streetcar Operators	\$ 28.56	5,920
Sailors and Marine Oilers	\$ 18.59	31,280
Captains, Mates and Pilots of Water Vessels	\$ 34.50	30,220
Motorboat Operators	\$ 18.81	2,550

**Table A39: Group No. 39**

Material moving equipment operators	Mean Hourly Wage	Estimated U.S. Employment
Logging Equipment Operators	\$ 16.40	22,470
Conveyor Operators and Tenders	\$ 14.90	37,200
Crane and Tower Operators	\$ 24.06	41,070
Dredge Operators	\$ 18.32	1,590
Excavating and Loading Machine and Dragline Operators	\$ 19.48	47,530
Loading Machine Operators, Underground Mining	\$ 22.44	2,290

Hoist and Winch Operators	\$ 22.40	3,320
Industrial Truck and Tractor Operators	\$ 15.31	503,290

**Table A40: Group No. 40**

Construction laborers	Mean Hourly Wage	Estimated U.S. Employment
Brick-masons and Block-masons	\$ 24.40	62,560
Stonemasons	\$ 18.96	11,950
Carpenters	\$ 21.31	578,978
Carpet Installers	\$ 19.55	24,670
Floor Layers, Except Carpet, Wood, and Hard Tiles	\$ 18.67	9,660
Floor Sanders and Finishers	\$ 16.82	4,970
Tile and Marble Setters	\$ 19.65	28,630
Cement Masons and Concrete Finishers	\$ 18.93	135,330
Terrazzo Workers and Finishers	\$ 20.99	3,500
Construction Laborers	\$ 16.43	779,370
Drywall and Ceiling Tile Installers	\$ 20.01	75,520
Tapers	\$ 23.51	15,340
Electricians	\$ 25.44	512,290
Glaziers	\$ 20.01	41,960
Insulation Workers, Floor, Ceiling, and Wall	\$ 17.71	24,170
Insulation Workers, Mechanical	\$ 20.78	28,600
Painters, Construction and Maintenance	\$ 18.67	184,820
Paperhangers	\$ 20.10	4,230
Pipe-layers	\$ 18.98	43,570
Plumber, Pipefitters and Steamfitters	\$ 24.92	349,320
Plasterers and Stucco Masons	\$ 20.07	22,810
Reinforcing Iron and Rebar Workers	\$ 21.83	15,730
Roofers	\$ 18.54	95,840
Sheet Metal Workers	\$ 22.37	130,670
Structural Iron and Steel Workers	\$ 24.11	56,920
Helpers--Brick masons, Block masons, Stonemasons, and Tile and Marble Setters	\$ 14.65	26,750
Helpers--Carpenters	\$ 13.20	40,160
Helpers--Electricians	\$ 13.84	65,300
Helpers--Painters, Paperhangers, Plasterers, and Stucco Masons	\$ 12.25	10,980



Helpers--Pipe layers, Plumbers, Pipefitters, and Steamfitters	\$ 13.66	51,420
Helpers--Roofers	\$ 11.99	12,540
Highway Maintenance Workers	\$ 17.47	143,760
Rail-Track Laying and Maintenance Equipment Operators	\$ 21.78	15,590
Septic Tank Servicers and Sewer Pipe Cleaners	\$ 17.13	24,940
Segmental Pavers	\$ 16.27	1,330

**Table A41: Group No. 41**

Freight, stock, material handlers	Mean Hourly Wage	Estimated U.S. Employment
Cargo and Freight Agents	\$ 19.56	80,570
Couriers and Messengers	\$ 12.79	83,250
Shipping, Receiving, and Traffic Clerks	\$ 14.65	687,940
Stock Clerks and Order Fillers	\$ 11.66	1,782,800
Weightiers, Measurers, Checkers, and Samplers, Recordkeeping	\$ 14.07	68,090
Helpers--Production Workers	\$ 11.72	420,910
Laborers and Freight, Stock, and Material Movers, Hand	\$ 12.62	2,063,580
Packers and Packagers, Hand	\$ 10.81	666,860
Tank Car, Truck, and Ship Loaders	\$ 20.84	10,960

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