A Holland Perspective on the U.S. Workforce from 1960 to 2000
Technical Report No. 45[1]

By

Robert C. Reardon, Ph.D.
Emily E. Bullock, MS
Katie E. Meyer, MS/Ed.S.

August 18, 2005

Center for the Study of Technology in Counseling and Career Development
The Florida State University
Tallahassee, FL 32306-2490

Abstract: This paper analyzes civilian occupations and employment data collected by the Census Bureau in 1960, 1970, 1980, 1990, and 2000 with respect to six kinds of work (Holland's RIASEC classification), occupation, employment, gender, occupational level, and income over five decades. Implications for further research, employment policy, and career services are offered.

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[1] Portions of this paper previously appeared in *A Holland Perspective on the U.S. Workforce from 1960 to 1990: Technical Report No. 33* available at www.career.fsu.edu/techcenter. A published version of this earlier work appeared in Reardon, R. C., Vernick, S. H., & Reed, C. R. (2004). A Holland perspective on the U.S. workforce from 1960 to 1990. *Journal of Career Assessment, 12*, 99-112. The authors thank Lindsey Pugh for comments on this report.

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Executive Summary

Some career theorists and researchers view the occupational world as increasingly unstable and unpredictable. Indeed, they view the concept of job or occupation as less than useful in thinking about work and career guidance. Such a view appears to call into question the appropriateness of an approach to career guidance that seeks to link personal characteristics to jobs in a time of rapid labor market changes. Holland's typological theory (Holland, 1997) specifies a connection between vocational personalities and work environments that makes it possible to use the same RIASEC classification system for both persons and jobs. Beginning in the 1960s and 1970s, a small group of researchers began to examine the labor market using Holland's typological system. Altogether, these studies examined a variety of variables with respect to Holland codes, including percentage of men and women in occupations, ethnicity of workers in occupations, salaries earned by occupational incumbents during the preceding year, educational and training levels associated with occupations, and complexity ratings for occupational activities.

The present study examined trends in labor market characteristics using census data from 1960 to 2000. We found stability in the census data for the use of occupational constructs for six kinds of work from 1960-2000, e.g., the Realistic area includes many more named occupations in the census than the other five areas, ranging between 43% and 50% of all occupations included over the five census periods. Regarding levels of cognitive complexity associated with occupations, we found Investigative and Artistic areas were associated with the highest complexity ratings, and Conventional was associated with the lowest ratings. We found that employment trends revealed some complex shifts in employment across the six kinds of work. For example, employment in the Realistic area declined by 25% from 1960 to 2000 relative to other Holland types, but it remained the largest area of employment and actually increased in real numbers from 1960 to 2000. Only 1% of employment was in the Artistic area. There were marked differences in employment between men and women across the six areas from 1960-2000, e.g., between 75% and 85% of male workers were in the Realistic and Enterprising areas and only 15% to 25% of men were employed in the other four areas, while women were employed in more varied kinds of work, including Conventional, Realistic, Social, and more recently, Enterprising areas. Regarding cognitive complexity and kinds of work, we found employment in the Investigative area occurred only at the highest two levels. The other four areas, Realistic, Social, Enterprising, and Conventional, showed employment in all six levels of complexity ratings. We found that employment was related to the level of cognitive complexity of work, and that employment was also unevenly distributed across the six areas of work in relation to gender. Finally, we examined income and gender by kinds of work and found the average income profile for six kinds of work ranging from lowest to highest was CRASEI in 1990 and CRAESI in 2000. The discrepancy across the six areas was very large, with the average Investigative income about twice as large as the average Conventional income.

Our study suggested that there was considerable stability in the nature of occupations used to report employment in the census with respect to Holland codes. The often discussed dramatic shift in the nature of work, and by implication the occupations that encompass work, was not apparent in these data, although there was considerable variability in the numbers of occupations across the RIASEC areas. Although employment in the Investigative area doubled over the five decades of our study, it remained only 8% of employment in 2000. Career guidance programs could use census information to show the relationships between kinds of work, cognitive skill development, gender, and financial income.

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Holland's RIASEC typology has become a common tool for classifying persons and environments in career guidance and counseling. It is now incorporated into the Occupational Information Network (O*NET), a comprehensive database that provides information about 975 occupations, worker skills, and job training requirements. O*NET, sponsored by the U.S. Department of Labor's Employment and Training Administration (U.S. Department of Labor, 1998), is the primary source of U.S. occupational information and its data are included in many computer-based career information delivery systems, e.g., Choices Planner, Career Information System. Moreover, most career assessment instruments for individuals report scores based on Holland codes because this has become a standard method for linking persons and occupational alternatives.

Given the extensive use of the RIASEC typology in career guidance services, it would seem important to examine the actual distribution of jobs in the U.S. economy, and to determine if the distribution of jobs is changing as a result of varied socioeconomic changes. For example, has the distribution of jobs in RIASEC categories changed in the past 50 years? Is the increase in the number of women working outside the home reflected in such census job data? Related to these environmental questions, Holland (1997) noted several "rules" to use in interpreting the Self-Directed Search interest inventory, such as the Rule of Asymmetrical Distribution of Types and Subtypes. This rule reminds a counselor and client that the distribution of types across the six RIASEC areas is very uneven and unequal. Codes associated with small employment numbers may have fewer jobs and replacement openings.

Holland's typological theory (Holland, 1997) specifies a theoretical connection between vocational personalities and work environments that make it possible to use the same RIASEC classification system for both persons and jobs. Use of the typology enables individuals to categorize their interests and personal characteristics in terms of the six types and combinations of the types. In Holland's theory, persons can be categorized as one of six personality types: Realistic, Investigative, Artistic, Social, Enterprising, or Conventional. In a similar way, the environments of college campuses, fields of study, work positions, and occupations can be classified using the same RIASEC system.

Beginning in the early 1970s, Consuelo Arbona, Gary D. Gottfredson, Linda S. Gottfredson, John Holland, and others began to examine the U.S. labor market using the RIASEC classification system. This work was important for both theoretical and practical reasons. For example, if the number of annual job openings is strongly related to the number of people working in that area, then knowing the number of persons employed is of practical importance in job hunting. In a series of studies, G. D. Gottfredson and Daiger (1977); G. D. Gottfredson and Holland, (1975); G. D. Gottfredson and Holland (1989, 1996); G. D. Gottfredson, Holland, and L. S. Gottfredson (1975); G. D. Gottfredson, Holland, and Ogawa (1982); L. S. Gottfredson and Brown (1978); L. S. Gottfredson (1978); and L. S. Gottfredson (1980) analyzed U.S. employment using data provided by the decennial census in 1960, 1970, and 1980. In similar fashion, Arbona (1989) examined 1980 census data to explore gender, educational level, and ethnicity, e.g., Black, Hispanic, and White, with respect to population employment distribution. Altogether, these studies examined a variety of variables with respect to the Holland RIASEC classification, including percentage of men and women working in hundreds of occupations, ethnicity of workers in occupations, salaries earned during the preceding year by incumbents, educational and training levels associated with occupations, occupational prestige, and the levels or complexity ratings for occupations.

After a 15-year hiatus in this research, Reardon, Vernick, and Reed (2004) analyzed the 1990 census data in relation to the Holland typology and in relation to data from 1960, 1970, and 1980. They found stability in the census data for the use of occupational constructs for six kinds of work from 1960-1990, e.g., the Realistic area included many more named occupations in the census than the other five areas, averaging between 46% and 50% of all occupations over the 40-year period. While employment declined by 18% in the Realistic area relative to other Holland types, it remained the largest area of employment through 1990 and actually increased in real numbers. Only 1% of employment was in the Artistic area. There were marked differences in employment between men and women across the six areas from 1960-1990. Between 79% and 85% of male workers were in the Realistic and Enterprising areas and only 15% to 21% of men were employed in the other four areas, while women were

employed in more varied kinds of work, including Conventional, Realistic, Social, and more recently, Enterprising areas. Reardon et al. examined income and gender by six kinds of work and found the average income profile ranging from lowest to highest was CRASEI. The discrepancy across the six areas was very large, with the average Investigative income more than two times larger than the average Conventional income.

The data included in these studies are unique in several ways and have special implications for career counselors. First, the U.S. Department of Labor, not the Census Bureau, is the source of much labor market information used by counselors. As an independent branch of the federal government, the Census Bureau reports actual numbers of people working in different occupations based on an accounting of persons in households. Second, these data provide a retrospective look at the labor markets, and by examining them over time it is possible to examine changes in the economic lives of persons in the United States. Third, the occupational titles included in the census have remained constant over the years, only changing slightly.

The purpose of the present study was to examine employment trends reported in earlier research using census data and to add new analyses based on the 2000 census. The present study further examined level, gender, and income in terms of the 1990 and 2000 census data. Our research questions included:

1. What were the numbers and percentages of census occupational titles listed in 1960, 1970, 1980, 1990, and 2000 in relation to six different kinds of work (Holland RIASEC categories)?

2. How was occupational level related to different kinds of work in 1990 and 2000?

3. What were the numbers and percentages of occupational employment in 1960, 1970, 1980, 1990, and 2000 in relation to six kinds of work?

4. What were the numbers and percentages of occupational employment in 1960, 1970, 1980, 1990, and 2000 for men and women in relation to six kinds of work?

5. What were the incomes for different kinds of work for men, women, and the total population in 1990 and 2000?

6. What was the age and gender distribution of workers in six kinds of work in 2000?

Methods

The occupational data collected by the U.S. Bureau of the Census are based on census researchers' analysis of hundreds of thousands of jobs and employment reported by citizens in each census period. Researchers then categorize the detailed job information into occupational groups using the census occupational codes (Bureau of Census, 1992a). In the 2000 census researchers used the Standard Occupation Code (SOC; U.S. Dept. of Labor, 2000) to classify occupations. We used the Holland codes assigned to occupations by different researchers at the time the original research was completed in 1960, 1970, 1980, 1990, or 2000. It should be noted that the codes were changed for some occupations over the years as additional data were collected and new methods for coding occupations were developed.

Each housing unit in the country received either the short- or long-form census questionnaire. The short form asks a limited number of basic questions of all people and housing units, and are often referred to as 100-percent questions because they are asked of everyone. The long-form asks more detailed information from a population sample, and includes the 100-percent questions as well as questions on education, employment, income, ancestry, homeowner costs, units in a structure, number of rooms, plumbing facilities, and so forth. The results of the present study are based largely on findings from the long-form questionnaire.

Employment Data

In the 1960 census, the sampling unit was the housing unit, or the person in the case of group housing, which provided information about 297 detailed occupational categories. L. S. Gottfredson and Brown (1978) described the methods they used to derive Holland codes for 1960 census data using 1970 census data as a point of reference. L. S. Gottfredson and Brown also assigned general educational development (GED) level estimates using

the *Dictionary of Occupational Titles* (U.S. Department of Labor, 1965) to each occupation. GED ratings, ranging from one to six, provide an estimate of the general educational level required to perform a job, e.g., levels 5-6 indicating college and postgraduate training. G. D. Gottfredson and Daiger (1977) analyzed 1960 census data based on workers age 16 and over, and their analysis is based on a 5% sample of the population.

In the 1970 census, the sampling unit was the housing unit, and 440 detailed occupational titles were included in these data, 143 more than in 1960. As with the 1960 census, the data included only employed persons and excluded members of the armed forces. L. S. Gottfredson and Brown (1978) provided a detailed explanation of the methods they used to derive Holland codes and GED estimates for 1970 census data. G. D. Gottfredson and Daiger (1977) analyzed 1970 census data based on workers age 16 and over, and their analysis is based on a 5% sample. They noted that the Census Bureau made some changes in the occupational classification between 1960 and 1970, with the former being less detailed. G. D. Gottfredson, Holland, and L. S. Gottfredson (1975) analyzed data from the 1970 census involving 424 occupations, and excluded men (5.6%) and women (6.6%) not classified according to one of the detailed occupations.

Information about the 1980 census was taken primarily from G. D. Gottfredson and Holland (1989) and G. D. Gottfredson (1984). G. D. Gottfredson (personal communication, July, 2000) also provided census-related useful information linked to 3-digit 1980 census codes. The 1980 analysis was based on 503 selected occupations. Information available about each occupation included the census code number, Holland code, number of persons employed, percent of women in the occupation, GED rating, complexity rating, and average annual earnings in 1979.

Comprehensive information about the 1990 census was provided by the Bureau of Census (1992a, 1992b), and was based on 500 selected occupations. The housing unit was the sampling unit and detailed information was obtained about persons aged 16 and over. G. D. Gottfredson and Holland (1996) indicated that this classification is most closely related to the Standard Occupational Classification (SOC; U.S. Department of Commerce, 1980). Three sampling rates were used in 1990. For slightly more than one-half of the country, one in every six housing units (about 17 percent) received the long-form or sample questionnaire. In functioning local governmental units (counties and incorporated places, and towns and townships in some parts of the country) estimated to have fewer than 2,500 inhabitants, every other housing unit (50 percent) received the sample questionnaire in order to enhance the reliability of the sample data for these small areas. For census tracts and block numbering areas having more than 2,000 housing units in the Census Bureau's address files, one in every eight housing units (about 13 percent) received a sample questionnaire, providing reliable statistics for these areas while permitting the Census Bureau to stay within a limit of 17.7 million sample questionnaires, or a one-in-six sample, nationwide. The U.S. population count in 1990 was 283,928,233 (Bureau of Census, 1992b).

G. D. Gottfredson and Holland (1996) provided information about 468 occupations, including the code and the cognitive complexity rating of each occupation. Comparing the 1980 and 1990 census data, four new categories of work were added in the 1990 census and six were eliminated from the 1980 census. We collapsed multiple occupation entries into one occupational entry for the “manufacturing and non-manufacturing” occupations because there were a large number of entries that appeared to be very similar in nature. In particular, occupations with census codes 779-782 and 777-778 were collapsed into one entry with the code of 777, Miscellaneous Machine Operators, NEC. This was accomplished by averaging the data for both salary and number of individuals employed across the various entries representative of this occupation to come up with single data points for each of these variables. We also collapsed census codes 889-902 into one entry with the code of 889, Laborers except Construction. Other multiple entry occupations were collapsed into one occupational title by similarly averaging data for salary and number employed. This was done with census code 022 (Managers and Administrators, NEC), and 243-252 (Supervisors and Proprietors, Sales Occupations). Data for individuals who were classified as salaried and self-employed were collapsed into one occupational entry for both of these census codes. In developing the 1990 census data table, we also used the *Dictionary of Holland Occupational Codes* (G. D. Gottfredson & Holland, 1996) to identify the occupation’s Complexity Rating (Cx).

It is important to note that data in this study regarding employment are based on a sampling procedure. The Bureau of Census (1992a) has reported detailed methods for interpreting these data based on procedural errors and standard errors in sampling. Information about confidence intervals in estimates about population characteristics are quite technical and beyond the scope and precision of our study. For these reasons, we have rounded numbers in this

report to the nearest percent or thousand in order to avoid communicating a misplaced sense of precision in the findings.

The 2000 census counted 281,421,906 people in the 50 states and the District of Columbia. As in the past, short- and long-forms were used with about 17 percent (1 in 6 households) receiving the latter (U.S. Census Bureau, 2002). Four hundred and seventy one (471) occupations could be classified from the 2000 census. Holland codes were retrieved from several different resources. The following priority ranking was applied to how the occupations were researched and coded: *Dictionary of Holland Occupational Codes*, the *Dictionary of Occupational Titles*, and the O*NET online database. The majority of the occupations (*N* = 391, 83%) were coded using the *Dictionary of Holland Occupational Codes*, which also provided the occupations' estimated Complexity Rating. Approximately 80 (17%) occupations were coded according to the information provided by O*NET online. Of those occupations 9 (2%) were classified as "data not available" (DNA) due to the lack of information available about these occupations (e.g., logisticians, network and computer systems administrators, etc.). Complexity ratings for the 80 occupations classified according to O*NET did not have complexity ratings and therefore were not included in the analyses related to complexity ratings.

Results and Discussion

In this section we summarize the research data for each of the questions examined in the study and provide a discussion of our findings and analysis.

1. Occupations and Six Kinds of Work, 1960-2000

The first question focused on the numbers and percentages of occupational titles used in the census over five decades for six different kinds of work. Table 1 shows that the distribution of occupations using the Holland classification are extremely skewed in each decade. The Realistic area includes many more named occupations in the census than the other five areas, averaging between 43% and 50% of all occupations included over the five census periods. For example, the 2000 census specifies 186 occupations (43%) in the Realistic area and 248 occupations in the other five areas combined. Only 9 occupations (2%) are identified in the Artistic area. Overall, there was an increase of 300% in occupations in the Enterprising area, from 27 in 1960 to 100 in 1980 and 95 in 1990 and 2000. Finally, there were 282 occupations included in the 1960 analysis, which increased to 465 in 1970, 502 in 1980, and 500 in 1990. The 2000 census shows a decrease in the number of occupations to a total of 434.

Over the five decades of this analysis, the number of occupations in the Realistic, Investigative, Artistic, and Conventional areas have remained relatively stable, while the Social area has decreased slightly and the Enterprising area has increased. This indicates that there is considerable stability in the nature of the named occupations used to report employment in the decennial census with respect to Holland codes. However, it is possible that occupations may be shifting among industrial groups, which would suggest less stability in the labor market structure.

Insert Table 1 occupations/kinds of work about here

There are several practical implications of these findings. Holland et al. (1994) has specified important rules in interpreting results from the Self-Directed Search, including the rule of asymmetrical distributions of types and subtypes. This rule states that the distributions of persons across the six types are extremely uneven. Based on these findings, we would add that even the numbers of named census occupations are extremely uneven across the six kinds of work. For example, the cognitive schema based on RIASEC types that were used in 2000 to examine occupations were heavily skewed in the direction of the Realistic area (*N* = 186), with very few occupational titles associated with the Artistic area (*N* = 9). It might be noted that Table 1 shows the R occupations maintain a majority over the five decades of this analysis. In addition, analysis of percentages of occupational titles across the five decades reveals a remarkable stability in the six areas of work used to describe employment in the census, and little evidence of instability and change in the ways in which employment was reported, at least from a RIASEC perspective.

2. Occupational Level and Kinds of Work, 1990-2000

The second question concerned the relationship between occupational level and kinds of work in the 1990 and 2000 census. In earlier research in this area, occupational level was described in terms of General Educational Development (GED) and Specific Vocational Preparation (SVP); more recently occupational level has been described in terms of Cognitive Complexity (Cx). GED levels were assigned to an occupation based on the highest of three ratings of educational development in reasoning, mathematics, and language. These ratings indicated the general educational development typically required to enter or perform well in an occupation. The rating included the formal and informal education required to develop reasoning skills, the ability to follow instructions, and the ability to use language and mathematics. G. D. Gottfredson and Holland (1989) noted that "These general ratings are only estimates, and they should not be regarded as precise requirements" (p. 7).

SVP ratings for occupations were used to indicate the training time required for an occupation, and provided estimates of the time needed to become proficient in an occupation. Ratings ranged from 1 to 10, with the higher number indicating the longest periods, i.e., several years of in-service, on-the-job training (OJT) required for performing proficiently in the occupation (Gottfredson & Holland, 1989).

G. D. Gottfredson and Holland (1996) created the Complexity Rating (Cx) to estimate the cognitive skill and ability associated with an occupation. In effect, the Cx rating summarizes the GED (General Educational Development Level) and SVP (Specific Vocational Preparation) level ratings used previously. In developing the complexity rating, Gottfredson and Holland wanted to make greater use of job analysis ratings obtained by the Bureau of Labor Statistics and to create a single measure of cognitive or substantive complexity associated with an occupation. They noted that "cognitive complexity of work demands" (G. D. Gottfredson & Holland, 1996, p. 723) might be an appropriate term for the complexity rating. The Cx rating of an occupation includes BLS ratings for Data, GED Reasoning, GED Math, GED Language, SVP, Intelligence, Verbal Aptitude, and Numerical Aptitude. Gottfredson and Holland (1996) reported a correlation of .94 between Cx and GED Reasoning ratings. Cx ratings range from 40 or less to 70 or more. For example, a Cx rating of 65 or higher could be associated with an occupation requiring a college degree and possibly post graduate work and on-the-job training of 4-10 years, while a Cx level of 50 might characterize an occupation requiring a high school degree and a year or more of OJT. The Cx rating for Nuclear-Fuels Research Engineer (IRC) is 80, while Shoe Shiner (CRE) is 37 and Counselor (SAE) is 68.

Table 2 summarizes data for cognitive complexity levels by kinds of work in the 1990 and 2000 census data using two-letter Holland subcategories. This table shows that four subcategories in the 1990 census, RA, IC, AC, and CA, and six subcategories in the 2000 census, RA, IC, AS, AC, AI, and CA, did not capture any named occupations used in the census report. These codes are also rarely attained by people who take the Self-Directed Search (SDS; Holland, Powell, & Fritzsche, 1994). Holland (1997) defined three levels of consistency in an SDS code in terms of the distance between the first two code letters on the hexagonal model. A high level means that the first two letters are adjacent on the hexagon (e.g., RI) and so forth. High consistency is theoretically positively correlated with predictability and stability in occupations, and the codes with no occupations listed above are characterized by average to low consistency.

Insert Table 2 and Figure 1 Cx ratings and kinds of work about here

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We averaged the Cx ratings from the two-letter occupational codes across the six kinds of work and found the average Cx ratings for the 1990 census were: R = 52; I = 72; A = 69; S = 63; E = 60; and C = 55. The following Cx ratings were found for the 2000 census were: R = 50; I = 71; A = 65; S = 61; E = 61; C = 53.

Figure 1 presents Cx ratings from lowest to highest for the two letter subcategories. Inspection shows that the Realistic and Enterprising areas are characterized by the most diverse Cx ratings. For example, RC has the lowest Cx rating and IR has the fourth highest rating for the 1990 and 2000 census. Not surprisingly, Investigative and Artistic areas are associated with the highest Cx ratings, and Conventional is associated with the lowest ratings. These findings regarding cognitive complexity are consistent with the findings reported earlier by Gottfredson and Holland (1989, 1996) with respect to GED levels and six kinds of work. They found that Investigative work, for

example, was associated with GED level six, the highest GED rating. This is consistent with our finding regarding the Cx rating for Investigative work.

There are additional interpretations that can be drawn from these data with respect to the social status or prestige associated with kinds of work. Nafziger, Holland, Helms, and McPartland (1974) reported that GED correlated .82 with the Duncan Socioeconomic Index and .90 with Temme's (1975) Occupational Prestige Index. These two scales provide indices of the status or prestige of an occupation. Indeed, L. S. Gottfredson (1980) noted that GED and occupational prestige (Temme Index) appear to be the same variable (r = .95). Given the correlation of .94 between GED Reasoning (one of eight scales used in Cx) and Cx reported by G. D. Gottfredson and Holland (1996), we suggest that there is a positive relationship between an occupation's complexity rating and the occupation's status or prestige ratings. Moreover, as we will show later, Cx may also be related to level of income. Thus, it may be inferred that the levels of prestige and social status associated with occupations vary across the six areas of work in similar ways as the complexity or GED levels.

L. S. Gottfredson (1980) has suggested that self-direction in work, e.g., the ability of workers to determine how they will spend their time at the job, is also positively related to prestige and GED levels. She noted that taking occupational level into account is important because level is associated with job-related authority and responsibility (e.g., try out one's own ideas), abstractness of work (e.g., working with data), and autonomy (e.g., self-direction). Given the differences among the six areas of work with respect to level, this helps explain why college students seeking high prestige work might be disappointed with the list of occupations in the Realistic or Conventional areas. A college student seeking a high prestige job in the Realistic area will have a more difficult time fulfilling his or her aspirations than a person exploring the Investigative area (L. S. Gottfredson, 1978). In our analysis, we logically view such self-direction to be related to the level of cognitive complexity in work. Investigative and Artistic kinds of work are closely tied to the highest occupational levels, and by association, to higher levels of prestige and self-direction. Even the adjectives associated with Investigative and Artistic personality types reflect independence, creativity, self-expression, idealism, and the ability to deal with abstractions such as data and symbols.

Thus far we have analyzed occupations with respect to the area of work and the level of cognitive complexity. In the following sections we shift the analysis to people and actual employment across the six kinds of work. We will also examine other variables in this regard, including cognitive complexity, gender, and income.

3. Employment in Six Kinds of Work, 1960-2000

The third question concerned the numbers and percentages of persons employed in six kinds of work from 1960 to 2000. This question differs from the first question in that the focus is on the number of people employed in the six kinds of work rather than the number of named occupations associated with the six kinds of work. Table 3 indicates that the total estimated employment increased over the four decades from 64.1 million in 1960 to 121.0 million in 2000. Table 3 also provides information that is related to information in Table 1 in that actual employment across the six areas resembles the distribution of occupational titles in the census data. For example, the Realistic area had the most occupational titles and the largest number of individuals employed, and Artistic had the fewest occupational titles and the fewest number employed. Noteworthy is the fact that the gap between the number of people employed in Realistic and Enterprising areas is shrinking from 38 percent in 1960, to 11 percent in 1990, to approximately the same percentage in 2000. The Realistic and Enterprising areas have approximately the same number of people employed in them. The profile of kinds of work (occupational titles) from highest to lowest in 2000 was REISCA (see Table 1), and the profile of kinds of employment in 2000 was RESCIA (see Table 3). The percentage of Realistic employment declined 25% between 1960-2000, between 5-7% each decade, but it remained the largest area of employment over the five decades. In contrast, employment in the Enterprising area increased by 13% between 1960-2000 (11.1 million to 35.9 million) in relation to the other five areas, and the percentage of individuals employed in the Investigative area more than doubled between 1960 and 2000 (from 3% to 8%, or 2.0 million to 9.3 million). Employment in the other four areas remained more stable.

The largest area of employment in 2000 was Realistic, followed in order by Enterprising, Social, Conventional, Investigative, and Artistic (RESCIA). This differs from the order in from 1960 – 1990. Until 2000, there was a higher percentage of people employed in the Conventional area than the Social area making the order, RECSIA. This ordering of kinds of work representing 2000 employment (RECSIA) (Bureau of Census, 1992a)

stands in contrast to the projected order of the 20 occupations identified by the Bureau of Labor Statistics (Horrigan, 2003-2004), which projected that the most new jobs through 2012 would follow the pattern SERCIA.

Insert Table 3 employment/decade about here

Altogether, analysis of the employment numbers over 50 years does not support claims of a major shift in employment across the six kinds of work. While employment declined by 25% in the Realistic area, it remained the largest area of employment through 2000 followed closely by the Enterprising area. Yet, there is a marked decline in the number of people employed in Realistic areas from 1990 (N = 42.7 million) to 2000 (36.7 million). It is especially noteworthy that the percent of employment in the Investigative area did not increase dramatically, given the apparent rapid growth in information and technology jobs. This finding illustrates the difference between the numbers of jobs or employment and the percent of change or growth in employment. Although employment in the Investigative area doubled over 50 years, it remained only 8% of total employment in 2000. Some critics (Roberts, 2003) argue that the loss of these jobs is partly the result of America's export of information and technology jobs to low-wage countries.

These data also provide a way to think about employment opportunities in terms of replacements. It is reasonable to expect that the kinds of work with the most employment will also have the most replacements. Mittelhauser (1998) identified three factors influencing the number of job openings: employment growth (new jobs), educational upgrading (organizations increasing educational requirements for existing jobs), and replacement openings. Mittelhauser (1998) indicated that given population changes, the number of job openings attributed to replacements was projected to increase from 21% in 1986-1996 to 34% from 1996-2006. While 2 out of 3 jobs are related to employment growth, a substantial percentage is related to replacement. In this regard, it seems appropriate to consider using the Holland classification to study and describe job openings in the future.

4. Employment, Gender, and Kinds of Work, 1960-2000

The fourth question concerned employment for men and women over five decades in six kinds of work. Table 4 shows employment for six kinds of work by gender. This is the same information represented in Table 3, but Table 4 shows the gender differences in the number of people employed in the six kinds of work. For men, most employment was in the Realistic area, followed by the Enterprising area. Over the five decades, between 75% and 85% of male workers were in these two areas. This means that only 15% to 25% of men were employed in the other four areas. Table 4 shows that male employment in the Realistic area has decreased over the five decades while the total and percentage of employment in the Realistic area still remains the highest for the six kinds of work (44%), it was only .4 million higher in 2000 than 1960.

Women have been employed in more varied kinds of work, including Conventional, Realistic, Social, and more recently, Enterprising areas. Indeed, the percentage of women in the Enterprising area has more than doubled over the five decades, from 13% to 28%. In contrast, there were slight decreases in the Conventional and Realistic areas. For example, the percentage of women employed in Realistic occupations decreased from 33% in 1960 to 15% in 2000 in spite of efforts to encourage nontraditional work for women. Yet, the percentage of women in Investigative occupations increased from 1% in 1960 to 6% in 2000. From 1960-1990, Conventional was the area of work in which most women were employed, but in 2000 that shifted to the Enterprising area. In 2000, 28% of women were employed in Enterprising occupations and 26% were in Conventional occupations. The percent of women employed in the Social area remained relatively constant over the four decades, although the actual number employed increased from 3.8 million in 1960 to 13.5 million in 2000. Artistic work consistently showed the smallest percentage of employment for women from 1960-2000.

Insert Table 4 employment, gender, work about here

Further analysis reveals that although male employment has been concentrated in the Realistic and Enterprising areas, there has been an increase of employment in the Investigative area from 4% to 10% over the five

decades (1.7 million to 6.1 million). There was a corresponding increase for women from 1% to 6% in the Investigative area (.3 million to 3.1 million). Employment for both men and women remained stable in the Artistic area at 1%. However, it must be noted that in 2000 only 11% of male employment and 7% of female employment was associated with work in the combined Investigative and Artistic areas. Table 4 also reveals the wide disparity regarding employment in 2000 for men and women across the six kinds of work, ranging from 44% for men in the Realistic area to 1% for both men and women in the Artistic area.

These findings for gender and employment for five decades suggest that men have been reluctant to move into areas of work frequented by women. Indeed, Table 4 appears to indicate a relatively stable pattern of employment for men and women in six kinds of work over five recent decades. An analysis of the age composition of workers in occupations would reveal more about the relationships among gender, employment in traditional male or female dominated occupations, and labor force changes across six kinds of work. We will examine this issue in a later section.

5. Kinds of Work, Gender, and Income in 1990 and 2000

The fifth question concerned the income for men, women, and the total population in different kinds of work in 1990 and 2000. Table 5 presents the income levels for men and women in different kinds of work. Because of constraints in the method of census data collection, the process for calculating the income levels differ for the 1990 and 2000 census years. Comparisons between the two years should be made with caution. The more accurate way of viewing Table 5 is through the continued discrepancy with regards to income among the Holland types. These numbers shows wide variations in income levels among different groups.

Insert Table 5, kind of work, gender, and income about here

Table 5 shows average income profile for six kinds of work ranging from lowest to highest as CRASEI for men in 1990, CRAESI for women in 1990, CREASI for men in 2000, and REASCI for women in 2000. The discrepancy between the overall average Investigative income was more than two times larger than the average Conventional income in 1990, but this was only true for men in 2000. For women in 2000, the average income for Investigative work was more than two times larger than the average Realistic income.

Table 5 examines employment income across different kinds of work in relation to gender. Table 5 indicates that the income for women in 1990 is lower than for men in all six categories, and the discrepancy becomes greater as income levels rise. Table 5 shows income for women in 2000 is lower than for men in all categories except Conventional. It is interesting to note the income levels of men and women in relation to employment percentages across the different kinds of work.

6. Kinds of Work, Age, and Gender in 2000

The sixth question concerned the age and gender distribution of workers in the six kinds of work according to the 2000 census. Table 6 depicts the number and percentage of men and women in the four age groups given by the 2000 census according to the six types of work (i.e., 60 and over, 50-59, 40-49, and 16-39).

Insert Table 6 Work, Age, and Gender about here

We speculated there would be significant differences among the age groups with regards to the percentages employed in the different kinds of work. For example, we anticipated that younger men would not be employed in the Realistic area because it is an area of declining employment. However, the data reveals a greater percentage of male workers under 40, 48%, are employed in Realistic areas as opposed to only 41% of men over 40. Table 6 shows that there is very little discrepancy among the percentage of male and female workers employed in the various kinds of work with regards to age. A few trends regarding Enterprising work are shown in Table 6. For

women under 40, 30% are working in Enterprising areas as opposed to only 26% for the over 40 group. For men under 40, 29% are working in Enterprising areas as opposed to 33% in the over 40 group. Table 6 shows that the percentage of men working in Realistic areas increases as age decreases. For example, for men 60 and over 39% are working in Realistic areas and for men 16-39, 48 % are working in Realistic areas.

Implications

In this section we examine the implications of these findings with respect to public policy regarding education and work and the provision of career services.

Public Policy

The findings of this analysis of kinds of work in relation to gender, cognitive complexity, age, and income provide some novel and interesting implications for workforce planning policy. For example, men, who are most segregated with respect to the six areas of work (8 out of 10 work in either the Realistic or Enterprising area), might be encouraged to explore occupations that are frequently dominated by women (e.g., Social). Women, on the other hand, who are more equally distributed across the Conventional, Realistic, Social, and Enterprising areas, might be encouraged to pursue occupations associated with higher complexity levels (e.g., Investigative). Scholarships and mentoring programs might encourage more gender diversity in relation to areas of work.

Our findings indicate that most people are employed in Realistic, Enterprising, and Conventional occupations requiring low to medium levels of cognitive complexity. It seems that much of our public discussion of employment and career preparation is directed at occupations with combinations of codes in the Investigative, Artistic, and Social areas, which also require or provide higher levels of cognitive complexity, social prestige, and income. These kinds of work employ few people. It appears that our promotion of occupational pursuits in these areas is somewhat different from what the U.S. economy has actually provided in employment over a 50 year period. However, we noted that the Bureau of Labor Statistics projects that the most new jobs through 2012 will be in the Social and Enterprising areas, followed by the Realistic area. It must be remembered that these are projected new jobs, which seem to capture more public attention and interest than the data regarding the actual employment at the moment. Given that one out of three jobs is related to replacement (Mittelhauser, 1998), it would also appear wise to encourage individuals to consider employment in areas with existing large employment numbers, especially in specific occupations employing more older workers.

The findings replicate the differences found by many other researchers in the employment of men and women. Moreover, these differences have persisted for five decades despite efforts to move women into areas dominated by men, e.g., Realistic, Investigative. While a large portion of women continue to be employed in the Conventional and Social areas, the employment of women in the Enterprising area is now where the highest number of women work for the first time in history. Our findings also indicate that income for men and women is not equitable across the six areas, with men reporting more income in every instance except Conventional. The analysis of the reasons for these discrepancies in employment and income across the six areas is beyond the scope of this discussion, but it is important to note that Holland's (1997) classification of occupations provides a potentially useful analytical perspective on these social issues. At the same time, we did not find differences in age for workers across the six areas of work; indeed, we found little discrepancy between men and women workers of different ages across the six areas of work.

Income for kinds of work is not equitable; moreover, the average Investigative income is about twice the average Conventional income. Given that women dominate employment in the Conventional area, the social implications of this finding are noteworthy. The 1990 and 2000 census results indicate that the ratings of cognitive complexity for six kinds of work from lowest to highest was RCESAI, and the order for income levels was CRASEI in 1990, CREASI for men in 2000, and REASCI for women in 2000. The relationships between cognitive complexity and income are strong.

Hirsh, Kidd, and Watts (1998) suggested that while occupation will probably remain a core construct in describing work and providing career services in the United Kingdom, it should be supplemented by other constructs, e.g., gender, cognitive complexity, income, employment, and time, for exploring individual career progression. We

would suggest that Holland's (1997) theory might add some of the characteristics they mentioned, and demographic research such as this study may add both practical and reality dimensions to the understanding of career phenomena.

Holland's Theory

Our study suggests that there is considerable stability in the occupational classification used to report employment in the census with respect to Holland codes. The often discussed dramatic shift in the nature of work, and by implication the occupations that encompass work, is not apparent in these data. Indeed, the persistence and stability of occupational titles used to describe work activities reported in the census are striking, although there is considerable variability in the numbers of occupations across the RIASEC areas used in Holland's (1997) theory.

Occupational level has been examined across kinds of work since the early 1970s, and the present study indicates that occupational level remains an important variable in six areas of work. The most recent conceptual measure of the level of skill and knowledge required for different kinds of work is the complexity level introduced by Gottfredson and Holland (1996). It showed a range of complexity ratings from 52 (Realistic) to 72 (Investigative). Given that occupational level correlates positively with occupational prestige, it appears that any analysis of the six kinds of work will reflect the relationships among these variables. These relationships, in turn, appear to be related to income levels across kinds of work.

Our findings show that Investigative work occurs at the highest levels of cognitive complexity, followed by the Artistic area. In contrast, Realistic and Conventional work are associated with the lowest levels of complexity. These findings help us understand more about Holland's theory with respect to level. In addition, gender differences also occur in the distribution of workers across the six areas. We concur with L. S. Gottfredson (1978) that it might be advantageous for women to explore more fully occupations in the Investigative and Enterprising areas where they are underrepresented in comparison to men.

Altogether, our findings do not indicate a dramatic shift in employment across the six areas of work. Although employment in the Investigative area more than doubled over the 50 year period of our study, it remained only 8% of employment in 2000. This suggests that Holland's (1997) matching model is supported by data and experience related to employment.

Career Services

The findings of this research regarding six kinds of work, income, age, and levels of cognitive complexity associated with occupations have multiple implications for career services. Career guidance programs in the schools could use this information to show students the relationships between kinds of work, cognitive skill development, financial income, and realistic job opportunities. Students wondering about the relationship between educational achievement and life style would be able to understand this more clearly through an analysis of actual employment data. Occupational information in computer-based guidance systems and other labor market publications, for example, could be redesigned to include census data in the descriptive information provided to users.

Holland (1997) has suggested that scores on the SDS that are low in consistency (first two letters are opposite on the hexagon, e.g., Realistic/Social) may have more difficulty in translating such codes into occupational alternatives. We found that six codes, RA, IC, AS, AC, AI, and CA captured limited or no named occupations in the 2000 census report. This underscores the need to provide special career assistance to persons with such codes.

In a similar fashion to L. S. Gottfredson (1978), we found that kinds of work varied widely in educational level and complexity ratings. If prestige ratings are highly correlated with complexity, then college students with Realistic and Conventional SDS inventory codes who are seeking high prestige occupations may need special assistance in interpreting inventory results.

Holland's theory suggests that a second or third letter in an occupational code may modify the impact of the first letter with respect to income and cognitive complexity. Counselors might help clients see how adding some Investigative or Enterprising aspects to their occupational pursuits may enhance the income associated with future occupational activities. Moreover, career assessment inventories using Holland codes to provide occupational information could use census data in the interpretive report information provided to users.

Male students might benefit from seeing the impact of stereotyping associated with kinds of work and their under representation in several areas, e.g., Social. Female students might consider cognitive complexity and salary of occupations in various Holland areas in selecting fields to pursue. This may increase female employment in Investigative, Artistic, and Enterprising areas.

Although we speculated that employment across the six areas might differ dramatically across age groups, this was not apparent in the 2000 census data. For example, we thought that younger men would be employed at a percentage rate below older men in the Realistic area because of reduced overall employment in this area. However, the opposite was true. Perhaps the finding underscores the fact that a large number of jobs actually involve replacements of older workers together with the fact that the Realistic area is the largest area of employment in the U.S. economy. Career counselors should be cautious in advising younger male workers to look for employment outside of the Realistic area.

Gottfredson, Holland, and Gottfredson (1975) found that people aspired to Enterprising jobs far below the rate of actual employment in that kind of work. At the same time, they aspired to Social and Artistic jobs at a rate well above the rate of actual employment. Career guidance programs might properly help participants to understand the economic realities of current employment data, rather than relying exclusively on projections of expected future occupational activity (U.S. Department of Labor, 2003-2004).

Thomas Gutteridge and Raymond Palmer, a researcher and career counselor, respectively, suggested that it is jobs that are changing, not occupations (as cited in Patterson & Allen, 1996). They noted that it is a mistake to consider the occupational world as unstable or unpredictable because the vast majority of occupations change very little. Our findings support their assertion in several ways. For example, when jobs are categorized as occupations there is no evidence of massive changes in relation to six kinds of work (Holland codes) over a 50-year period. The Realistic area still dominates both employment and occupational categories, and the Artistic area is still very small. While employment in the Investigative area has more than doubled over the period studied, the actual employment in this area remains at less than 10% for men and less than 6% for women. And, finally, it should be noted that occupations continue to be licensed by government agencies and monitored by professional associations—in this regard occupations show no signs of disappearing from public view.

Projections

Taking a different Holland-based perspective on labor market information, Reardon, Lenz, Sampson, and Peterson (2005) consulted a special issue of the *Occupational Outlook Quarterly (OOQ)*, "Charting the Projections: 2002–2012" (Horrigan, 2003-2004), for forecast information about the U.S. labor force. They also used the RIASEC codes for occupations in the *Dictionary of Holland Occupational Codes* (G. D. Gottfredson & Holland, 1996) in order to calculate the summary profile by giving each RIASEC letter 3 points for first position, 2 points for second position, and 1 for third. It should be noted that the occupations with the most openings are not new, different, or unique but rather familiar and common. There can be something very reassuring about this fact for persons involved in career planning. The more things change, the more they stay the same. Reardon et al. (2005) found the Holland summary code order of SERCIA for the 20 occupations projected to have the most openings through 2012. As a result, we see that the predominance of the Holland S and E codes shows that the occupations that will employ large numbers of people in the future will draw upon the social and enterprising skills of workers, their "people" skills.

Reardon et al. (2005) also found that the 20 occupations with fastest projected employment growth i.e., percentage of job growth, had a profile of SRICEA. It is somewhat surprising to see that the Realistic area has become more prominent in the latest projections. The Bureau of Labor Statistics predicts that the professional and related occupations group, which employs large numbers of college graduates, will grow faster and add more workers than any other occupational group through 2010 (Dohm & Wyatt, 2002). The most significant source of these jobs will be the replacement of workers leaving their positions. Millions of baby boomers will retire by 2010 and college graduates will fill their positions.

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Table 1

Number and Percentage of Census Occupations by Six Kinds of Work, 1960-2000

	Census Year									
	1960		1970		1980		1990		2000	
Kind of Work	N	%	N	%	N	%	N	%	N	%
R	141	50	216	46	238	47	241	48	186	43
I	40	14	51	11	59	12	60	12	51	12
A	14	5	18	4	14	3	10	2	9	2
S	39	14	70	15	47	9	51	10	48	11
E	27	10	75	16	100	20	95	19	95	22
C	21	7	35	8	44	9	43	9	45	10
Total	282	100	465	100	502	100	500	100	434	100

Table 2

Complexity Ratings (Cx) by Thirty Kinds of Work (2-Letter Occupational Codes), 1990 and 2000

Kinds of Work	1990 Cx Ratings	2000 Cx Ratings
RI	59	59
RA	--	--
RS	52	54
RE	50	50
RC	45	46
IA	74	74
IS	71	70
IE	71	72
IC	--	--
IR	73	71
AS	74	--
AE	66	66
AC	--	--
AR	60	60
AI	74	--
SE	61	61
SC	59	57
SR	60	64
SI	67	65
SA	66	64
EC	53	56
ER	58	60
EI	71	71
EA	59	56
ES	61	62
CR	49	49
CI	63	67
CA	--	--
CS	54	53
CE	52	53

Note: No occupations listed for codes marked –

Figure 1

Complexity Ratings (Cx) by Thirty Kinds of Work (Two Letter Occupational Codes), 2000

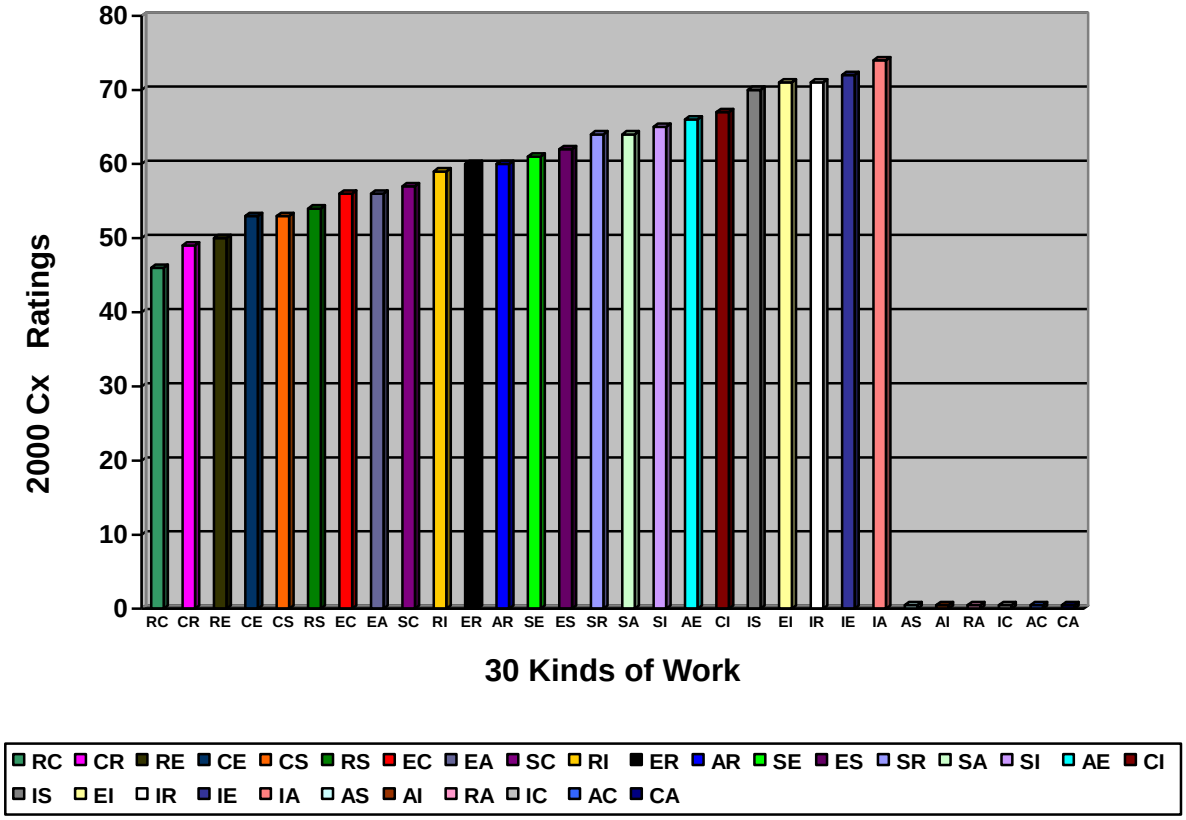

Table 3

Number and Percentage of Employment by Six Kinds of Work, 1960-2000 (Nearest Thousand)

	Census Year				
Kind of Work	1960*	1970*	1980	1990	2000
R	35,029	34,342	42,253	42,711	36,700
	55%	48%	42%	37%	30%
I	1,986	3,690	4,169	6,738	9,315
	3%	5%	4%	6%	8%
A	756	975	1,277	1,552	1,622
	1%	1%	1%	1%	1%
S	5,611	8,390	10,815	14,983	18,821
	9%	12%	11%	13%	16%
E	11,106	12,153	25,920	29,668	35,946
	17%	17%	25%	26%	30%
C	9,569	12,658	17,540	20,086	18,574
	15%	17%	17%	17%	15%
Total	64,057	72,208	101,974	115,738	120,978

Note: *Used by permission of Academic Press Inc., *Journal of Vocational Behavior*, *10*, p. 131. Copyright 1977 Academic Press Inc.

Table 4

Number and Percentage of Employment by Gender and Kinds of Work, 1960-2000 (Nearest Thousand)

	Census Year									
	1960*		1970*		1980		1990		2000	
Kind of Work	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
R	27,986	6,986	26,853	7,488	32,871	9,378	32,176	10,535	28,427	8,271
	65%	33%	60%	28%	56%	22%	52%	20%	44%	15%
I	1,723	259	3,203	486	3,185	984	4,745	1,993	6,129	3,185
	4%	1%	7%	2%	6%	2%	8%	4%	10%	6%
A	474	279	671	299	827	577	780	772	858	764
	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
S	1,861	3,772	2,622	5,772	3,348	7,468	3,816	11,167	5,252	13,569
	4%	18%	6%	21%	6%	17%	6%	21%	8%	24%
E	8,476	2,616	9,131	3,023	15,170	10,480	16,585	13,083	19,963	15,982
	20%	13%	20%	11%	26%	25%	27%	24%	31%	28%
C	2,550	7,066	2,563	10,093	3,022	14,518	3,771	16,316	3,782	14,792
	6%	34%	6%	37%	5%	33%	6%	30%	6%	26%
Total	43,070	20,978	45,043	27,161	58,424	43,675	61,873	53,866	64,411	56,563

Note: *Used by permission of Academic Press Inc., *Journal of Vocational Behavior, 10*, p. 131. Copyright 1977 Academic Press Inc.

Table 5

Annual Income (Dollars) of Men and Women in Six Kinds of Work, 1990 and 2000 Census

Kind of Work	1990			2000		
	Men	Women	Total	Men	Women	Total
Realistic	23,139	16,196	21,529	29,830	18,082	27,215
Investigative	43,795	27,250	41,499	53,703	39,358	48,592
Artistic	27,873	16,330	22,057	37,338	27,588	32,724
Social	30,543	21,187	25,095	42,731	28,764	32,506
Enterprising	31,561	20,145	27,493	30,899	19,577	26,109
Conventional	20,208	14,422	16,179	22,875	35,802	33,223

Table 6

Population (nearest thousand), Age (among four groups), and Gender by Kinds of Work, 2000

Age		R	%	I	%	A	%	S	%	E	%	C	%	Total
60+	Men	1,881	39	454	9	66	1	439	9	1,645	34	44	7	4,829
	Women	660	17	115	3	57	2	857	23	953	25	1,135	30	3,777
	All	**2,541**	**30**	**569**	**7**	**123**	**1**	**1,296**	**15**	**2,597**	**30**	**1,479**	**17**	**8,606**
50-59	Men	4,161	39	1,122	10	126	1	1,112	10	3,701	34	576	5	10,798
	Women	1,404	15	467	5	115	1	2,604	27	2,481	26	2,521	26	9,592
	All	**5,565**	**27**	**1,589**	**8**	**241**	**1**	**3,716**	**18**	**6,182**	**30**	**3,097**	**15**	**20,390**
40-49	Men	6,988	42	1,697	10	216	1	1,456	9	5,314	32	774	5	16,445
	Women	2,220	15	913	6	196	1	3,908	26	3,929	27	3,639	25	14,805
	All	**9,208**	**29**	**2,610**	**8**	**412**	**1**	**5,634**	**18**	**1,577**	**5**	**4,413**	**14**	**31,250**
16-39	Men	15,398	48	2,857	9	450	1	2,245	7	9,303	29	2,089	6	32,342
	Women	3,988	15	1,691	6	397	1	6,200	22	8,620	30	7,497	26	28,393
	All	**19,386**	**32**	**4,547**	**7**	**847**	**1**	**8,445**	**14**	**2,845**	**30**	**9,586**	**16**	**60,735**
Total	Men	28,428	44	6,130	10	859	1	5,252	8	19,963	31	3,782	6	64,414
	Women	8,271	15	3,185	6	764	1	13,569	24	15,982	28	14,792	26	56,565
	All	**36,669**	**30**	**9,315**	**8**	**1,622**	**1**	**18,821**	**16**	**35,946**	**30**	**18,574**	**15**	**120,979**