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Part IV Reference

Chapter 15 VALE Sources

VALE utilizes sources of information on job characteristics, employment, and earnings. The Dictionary of Occupational Titles (DOT) is used to define job-specific characteristics. Data from the 1990 Census provide information regarding employment and earnings. Both the job-specific characteristics and employment figures used by VALE are static from year to year. Earnings are updated annually through information contained in the March supplement of the Current Population Survey (CPS).

Occupational Data

The Dictionary of Occupational Titles (DOT), 4th Edition, Revised 1991 contains 12,741 separate job titles that are cross-referenced by worker characteristics required to perform work satisfactorily. The classification of job titles and worker characteristics is the responsibility of the U.S. Department of Labor, Employment and Training Administration. VALE utilizes 12,708 of these job titles, excluding 33 military occupations to focus on the civilian labor force.

Each of these 12,708 job titles is cross-walked to one of 501 Census Code occupational categories by the National Crosswalk Service Center, an agent of the National Occupational Information Coordinating Committee (NOICC). In addition, as later defined, thirty-one titles have been added to accommodate Census Code occupational categories that are void of DOT job titles, giving a total of 12,739 titles. These additional titles are also cross-walked to the Census Code occupational categories. Each of these three-digit Census Code categories is grouped into one of six broad occupational groups as follows:

1. Managerial and Professional Specialty
2. Technical, Sales, and Administrative Support
3. Service Occupations
4. Farming, Forestry, and Fishing
5. Precision Production, Craft, and Repair
6. Operators, Fabricators, and Laborers

Earnings and Employment Data

Data on earnings by Census Code occupational categories are available from several sources. Earnings for disabled and nondisabled persons by gender are reported in the 0.05 percent of the 1990 Census of Population and Housing. Data are also reported by Census Code occupational categories in the March supplement of the Current Population Survey (CPS), which is released by the Bureau of Labor Statistics. Earnings and employment data for a VALE labor market is first derived from the 1990 Census data. The most recent CPS data are utilized to adjust earnings to dollar values in terms of the CPS year. Applied to these CPS-adjusted annual earnings are ratios that permit conversion to local labor market dollars that are specific for disabled and nondisabled workers. These ratios are applied to the 1990 Census means and medians for the local labor market. This computation is performed to create the labor market data files that accompany the VALE software. Discussion regarding the calculation and application of these ratios is contained in sections Census Data and CPS Data.

Employment data are derived from the 1990 Census. These data are used to report the number of employed persons by three-digit Census Code category at the local labor market level. Unlike the earnings data, the employment data are static and therefore not modified by any other data source. A more detailed description of how VALE uses Census and CPS data follows.

Census Data

The U.S. Department of Commerce, Bureau of the Census, surveys the earnings for full-time wage and salary workers by detailed three-digit Census Code categories every ten years. Both mean and median earnings are derived for all persons (disabled and nondisabled combined), disabled persons, and nondisabled persons. The data are gender-specific and may be summarized at the national, state, and local labor market levels. The 1990 Census provides this information based on 1989 earnings and employment.

The mean earnings from the 1990 Census by broad occupational group are listed below. These mean earnings are segregated by gender and disability status. In addition the ratios of average disabled dollars to all person dollars and average nondisabled dollars to all person dollars are reported by gender. These ratios are the basis for the earning variability that exists by disability status.

Census Summary Group Ratios

Group	Disability Status	Earnings			Ratios		
		Total	Male	Female	Total	Male	Female
1	All Persons	40,861	49,037	28,627			
	Nondisabled	41,025	49,346	28,697	100.40%	100.63%	100.24%
	Disabled	34,876	39,237	25,400	85.35%	80.02%	88.73%

Group	Disability Status	Earnings			Ratios		
		Total	Male	Female	Total	Male	Female
2	All Persons	26,376	34,562	20,053			
	Nondisabled	26,444	34,772	20,099	100.26%	100.61%	100.23%
	Disabled	24,264	29,351	18,291	91.99%	84.92%	91.21%
3	All Persons	18,785	22,993	14,160			
	Nondisabled	18,858	23,138	14,224	100.39%	100.63%	100.45%
	Disabled	17,301	20,463	12,608	92.10%	89.00%	89.04%
4	All Persons	19,808	20,736	12,762			
	Nondisabled	19,975	20,917	12,918	100.84%	100.87%	101.22%
	Disabled	17,158	17,944	9,729	86.62%	86.54%	76.23%
5	All Persons	27,913	28,621	20,184			
	Nondisabled	27,999	28,716	20,234	100.31%	100.33%	100.25%
	Disabled	25,623	26,135	18,541	91.80%	91.31%	91.86%
6	All Persons	22,482	24,434	16,166			
	Nondisabled	22,568	24,541	16,217	100.38%	100.44%	100.32%
	Disabled	20,401	21,926	14,776	90.74%	89.74%	91.40%

Since there are a limited number of disabled workers within each of the three-digit Census Code categories, it is not possible to define accurately average earnings for disabled persons at the three-digit Census code level. This is true only to a limited degree at the national level, but exists to a greater degree at the state and local levels. Therefore, to portray reasonably the earnings variance that exists for disabled persons who work, a conversion geared to the six broad occupational groups is appropriate. Once these conversion ratios are obtained, they are applied to earnings figures from the most current CPS data. The ratios are applied to all the three-digit Census Code categories that fall within the relevant broad occupational group.

For example, the first broad occupational group is Managerial and Professional Specialty. This includes all three-digit Census Code category numbers between 003 and 199. The CPS earnings figures from each of these three-digit Census Code categories are multiplied by 1.0040 and 0.8535 to arrive at average nondisabled and average disabled earnings respectively. These earning figures expressed in CPS year dollars represent the best estimate of earnings for workers in the occupational group Managerial and Professional Specialty by disability status.

At the local level, i.e. state or metropolitan area, local dollars are obtained through the use of a conversion factor similar to the one used above for establishing discrepant patterns of the earnings of disabled and nondisabled persons. Problems with the sample size make it difficult to report local dollars by three-digit Census Code and virtually impossible to report local dollars for disabled persons without statistical interpolation.

In the example below, 1990 Census mean earnings for all persons at the national level are compared to 1990 Census mean earnings at a local level (New York City). This is done

for each of the six broad occupational groupings. The ratio revealing the variability existing at the local level is then applied to CPS earnings figures in each of the three-digit occupational categories within their respective broad occupational groupings. The same ratio is applied to all persons, men, and women by disability status. For example, suppose you want VALE to estimate earnings for Optometrists in New York City. VALE would take the CPS earnings for Optometrists and multiply them by 1.19, since this occupation falls in the first broad occupational group, namely Managerial and Professional Specialty.

Census Summary Group Ratios

Group	National	NYC	Ratio
1	40,861	48,659	1.19
2	26,343	31,176	1.18
3	18,785	23,222	1.24
4	19,808	22,517	1.14
5	27,983	31,037	1.11
6	22,481	23,749	1.06

The ratios used to differentiate between disabled and nondisabled workers and earning patterns for workers in various regions of the country are obtained through the 1990 Census. The dollars reported by VALE represent a single best estimate of earnings that vary as a function of region and disability versus nondisability status.

CPS Data

The U.S. Department of Labor, Bureau of Labor Statistics, collects national earnings data for full-time wage and salary workers on an annual basis. Both mean and median national earnings as well as the national number of employed persons are reported by detailed three-digit Census Code category. These earnings are reported for all persons combined and also by gender. The data are contained in an annual report entitled “Usual Weekly Earnings of Employed Wage and Salary Workers Who Usually Work Full-Time by Detailed (3 digit Census Code) Occupation, and Sex; Unpublished Tabulations from the Current Population Survey, Table A-26.”

When VALE reports mean or median earnings, it begins with data from the 1990 Census. The 1989 earnings contained in the census data are utilized to obtain the census to summary ratios for local labor markets and by disability status. This data source is utilized to obtain variability in earnings by locality and disability status. Applying these ratios to the most current CPS data provides the best estimate of earnings stated in CPS year dollars by disability status and locality. This conversion process to arrive at a labor market’s earnings for a CPS year is actually performed to create the base data files that VALE uses. Thus, this portion of the computation is already complete before any VALE run.

For example, suppose you want VALE to estimate the average earnings of nondisabled male Fire Fighters in New York City stated in terms of CPS year dollars. The New York

City labor market data recognize that Fire Fighters are part of the broad occupational group Service Occupations (group 3). The census to summary ratios by disability status and locality derived from the 1990 Census are retrieved. In this case, the census to summary ratio for nondisabled males in group 3 is 100.63% or 1.0063. The census to summary ratio for workers in New York City working in group 3 is 1.24. After retrieving these ratios, the average earnings of workers in Census Code 417 (Fire Fighters) from the CPS data is multiplied by 1.0063 and again by 1.24 to arrive at the estimated average earnings of nondisabled male Fire Fighters in New York City. This estimate is stated in terms of CPS year dollars.

Current Year Escalation

Since the earnings information developed from the CPS is usually one year in arrears, the above process does not result in the most current earnings. VALE allows optional (case-specific) adjustment to current-year dollars using the “Consumer Price Index, All Urban Consumers (CPI-U), U.S. City Average, All Items” which is provided by the U.S. Department of Labor, Bureau of Labor Statistics (see Chapter 21).

Data Modified for VALE

Outliers

VALE reports mean and median earnings by detailed three-digit Census Code category for Males, Females, and Both Sexes. Since there are 501 Census Code categories, this implies that VALE contains 1503 mean and median earnings figures that are gender specific and non-specific. In some cases, the CPS is missing earnings figures for Males, Females, or Both Sexes. In other cases, sample sizes are too small at the detailed three-digit Census Code category level to provide reliable estimates. There are also occurrences where estimates are considered unreliable because the standard error for the mean or median is at least sixty percent of the size of the mean or median. In these latter cases, the dollar figures are considered to be “Outliers.” The remainder of this section will explain how the CPS is adjusted for cases of missing earnings figures and Outliers.

Of the 1503 gender specific and non-specific Census Code categories, there were approximately 69 which were missing from the annual report entitled “Usual Weekly Earnings of Employed Wage and Salary Workers Who Usually Work Full-Time by Detailed (3 digit Census Code) Occupation, and Sex; Unpublished Tabulations from the Current Population Survey, Table A-26.” These include approximately 10 for males, 53 for Females, and six for Both Sexes. If the mean and median earnings for the Both Sexes category were missing, they were replaced by the earnings available in the next higher summary category for the Census Code. The table below provides details on the Census Code categories that were missing earnings figures for the Both Sexes category and how they were imputed.

<u>Census Code Category</u>	<u>Title</u>	<u>Method for Imputing Earnings</u>
258	Sales Engineers	Used earnings from summary category, Sales Reps, Commodities, Except Retail; split number employed from summary category equally between 258 and 259 (the only two Census Codes under the summary)
259	Sales Reps, Mining, Manufacturing & Wholesale	See 258
284	Auctioneers	Used earnings from summary category, Sales-related Occupations
403	Launderers & Ironers	Used earnings from summary category, Private Household Occupations
655	Misc. Precision Metalworkers	Used earnings from summary category, Precision Metalworking Occupations
868	Helpers, Extractive Occupations	Used earnings from summary category, Helpers, Construction and Extractive Occupations

An earnings figure is considered to be an Outlier if the Bureau of Labor Statistics reports that the Census Code category has a total of two thousand or fewer employed people or if the standard error of either the mean or median is at least sixty percent of the mean or median earnings figure. This resulted in approximately 152 Census Code category Outliers that are gender specific or non-specific. The same procedure is utilized to replace Outliers and missing earnings for men or women. The table below lists the Census Code categories that contain Outliers or missing earnings figures by gender.

Census Codes Categories by Gender With Missing Earnings or Outliers

Females

Missing 049, 054, 063, 088, 117, 136, 233, 258, 259, 284, 403, 454, 474, 497, 499, 514, 516, 519, 526, 543, 553, 554, 555, 557, 565, 566, 583, 584, 588, 596, 597, 598, 613, 614, 615, 644, 645, 655, 656, 659, 669, 705, 713, 814, 825, 828, 829, 833, 845, 848, 867, 868, 875

Outliers

003, 004, 019, 028, 046, 047, 058, 068, 074, 089, 113, 116, 124, 125, 126, 138, 139, 145, 146, 147, 148, 149, 153, 168, 215, 226, 228, 306, 309, 325, 347, 366, 404, 413, 416, 425, 455, 462, 473, 483, 489, 494, 495, 496, 498, 505, 506, 509, 515, 517, 527, 534, 535, 536, 538, 539, 544, 556, 563, 564, 577, 587, 589, 593, 594, 595, 616, 617, 634, 635, 636, 643, 646, 653, 654, 676, 693, 695, 696, 699, 704, 707, 714, 724,

725, 728, 729, 755, 764, 766, 773, 786, 798, 823, 826, 834, 843, 853, 855, 864, 865, 866, 876

Males

Missing 149, 204, 205, 258, 259, 284, 325, 403, 655, 868

Outliers 086, 088, 097, 117, 125, 136, 144, 145, 148, 153, 193, 285, 306, 309, 404, 405, 425, 466, 474, 483, 489, 499, 649, 659, 684, 729, 743, 793, 814, 825, 833, 845

Both Sexes

Missing 258, 259, 284, 403, 655, 868

Outliers 088, 117, 136, 149, 153, 306, 325, 473, 474, 494, 499, 659, 728, 814, 825, 833, 845

Imputing Missing Values for Earnings by Gender and Outliers

Missing values are imputed by examining the ratio of mean or median earnings at the detailed three-digit Census Code category level to the mean or median earnings at the next largest summary category level that the Census Code falls into. For example, let us look at Census Code 473 (Farmers) where earnings are Outliers for the Both Sexes category. VALE will check first if Male earnings are reported for Census Code 473. If they are reported, and if they are not also an outlier, earnings are imputed for the Both Sexes category using the following formula:

$$(MC / MS) * BS = BC$$

Here the values of MC and BC are the Census Code category mean or median earnings for the group of Males and Both Sexes, respectively. The values of MS and BS are the mean or median earnings of the next largest Summary Group containing Census Code 473 for the group of Males and Both Sexes, respectively. For Census Code 473, this summary group is Farm Operators and Managers. In this case the ratio of Census Code category earnings to Summary Group earnings is estimated as roughly the same for the groups Male and Both Sexes. If the Male Census Code category mean or median (MC) is on the list of Outliers, the Female ratio of Census Code to Summary Group earnings (FC / FS) is used to impute the value of earnings for the Both Sexes group. If both the Male and Female earnings at the Census Code level are on the Outliers list, the earnings at the summary category level will be used (i.e., MS = MC, FS = FC, BS = BC).

The table below illustrates the modifications made for VALE in this example. The table shows mean weekly earnings by summary group (Farm Operators and Managers) and for Census Code 473 (Farmers) for both sexes and males. In this case, the both sexes mean

dollar needs to be estimated based on the other three earnings figures. The table shows that male Farmers earned an average of \$400 per week while the average weekly earnings for males in the broader occupational group of Farm Operators and Managers was \$522. Therefore male Farmers, on average, earned $(400/522)*100$ or approximately 77 percent less than the average farm operator and manager. If one pooled men and women together into a “Both Sexes” group, it is reasonable to believe that the Both Sexes group of Farmers would have average earnings roughly 77 percent less than the average Both Sexes earnings of all Farm Operators and Managers (BS). This calculation which is made for VALE is shown at the bottom of the table. So VALE uses an imputed value of \$382 for the Both Sexes average earnings for Farmers. Similar calculations are also performed for median dollars.

Mean Weekly Earnings by Gender Group and Occupational Group

Level	Title	Male	Both Sexes
Summary Group	Farm Operators and Managers	MS = 522	BS = 498
Census Code	Farmers	MC = 400	BC = 382
$(400 / 522) * 498 = BC = 382$			

A similar technique is utilized to impute earnings missing for either Male or Female groups. When the earnings for Males or Females is missing or on the list of Outliers, it will be imputed by employing the Census to Summary Group ratio for Both Sexes whenever possible. In this case, VALE imputes the gender specific Census Code category earnings (GC) using information on the ratio of Census Code category earnings to Summary Group earnings for Both Sexes (BC / BS) and gender specific Summary Group earnings (GS). The following formula shows the calculation VALE makes in this situation:

$$(BC / BS) * GS = GC$$

If the Both Sexes Census Code category earnings is also on the Outliers list, the Census to Summary Group ratio for the opposite gender (OC / OS) is adopted in place of the Both Sexes Census to Summary Group ratio (BC / BS). If the Census to Summary Group ratio for the opposite gender is also on the Outliers list, the earnings for the summary category will be used.

Method for Splitting Combined Census Codes

There are eleven instances in the annual report entitled “Usual Weekly Earnings of Employed Wage and Salary Workers Who Usually Work Full-Time by Detailed (3 digit Census Code) Occupation, and Sex; Unpublished Tabulations from the Current

Population Survey, Table A-26” where two Census Code categories are combined into one listing. For use in VALE, these are split to correspond with the data gathered in the 1990 census. The following pairs of Census Code categories have been split: (003, 004), (473, 474), (475, 476), (505, 506), (563, 564), (567, 569), (575, 576), (585, 587), (634, 635), (637, 639), and (653, 654).

To derive the number employed for the individual Census Code categories, the number employed is divided by two and the result placed in each Census Code category. If the number employed reported by the Bureau of Labor Statistics is an odd number, the “extra person” is assigned to the first Census Code category. For instance, the Both Sexes Census Code categories 003 and 004 have been combined in the tabulations from the Current Population Survey and have a total number employed of 21. After the split, Census Code category 003 will be assigned a total number employed of 11 and Census Code category 004 will be assigned a total number employed of 10.

The mean and median earnings figures will not be adjusted in any way. Therefore, both of these Census Code categories are assigned the same mean and median annual earnings.

Census Codes Without DOT Titles

Thirty-one of the Census Code categories are void of occupational titles. None of the 12,708 civilian job titles from the DOT are cross-walked by the NOICC to these thirty-one Census Code categories. Therefore, in order to utilize the employment and earnings data contained in these thirty-one Census Code categories, worker characteristics conforming to comparable occupational titles were created. The thirty-one Census Code categories and the worker characteristics assigned to them are listed below.

JOB TITLE/#	CENSUS CODE CAT.	SVP	GED			-APTITUDES-											Strength	
			R	M	L	G	V	N	S	P	Q	K	F	M	E	C		
LEGISLATORS 000.117-000	003	8	5	4	5	2	2	3	4	4	4	4	4	4	4	5	5	L
EARTH, ENVIRONMENTAL, AND MARINE SCIENCE TEACHERS 000.227-000	113	7	6	6	6	1	1	1	2	2	2	3	3	3	4	4		L
BIOLOGICAL SCIENCE TEACHERS 000.227-000	114	8	6	6	6	1	1	2	1	2	2	3	3	3	5	3		L
CHEMISTRY TEACHERS 000.227-000	115	8	6	5	5	1	1	1	3	3	2	3	3	3	5	3		L
PHYSICS TEACHERS 000.227-000	116	8	6	6	6	1	1	1	1	3	2	4	4	4	5	4		L
NATURAL SCIENCE TEACHERS, N.E.C. 000.227-000	117	7	5	4	5	2	2	3	3	3	3	4	4	4	5	3		L
PSYCHOLOGY TEACHERS 000.227-000	118	8	6	6	5	1	1	2	3	3	2	4	4	4	5	5		L
ECONOMICS TEACHERS 000.227-000	119	8	6	5	5	1	1	2	3	3	2	4	4	4	5	5		L
HISTORY TEACHERS 000.227-000	123	8	6	5	5	1	1	2	3	3	2	4	4	4	5	5		L
POLITICAL SCIENCE TEACHERS 000.227-000	124	8	6	5	5	1	1	2	3	3	2	4	4	4	5	5		L
SOCIOLOGY TEACHERS 000.227-000	125	8	6	5	5	1	1	2	3	3	2	4	4	4	5	5		L

JOB TITLE#	CENSUS CODE CAT.	SVP	GED			-APTITUDES-											Strength
			R	M	L	G	V	N	S	P	Q	K	F	M	E	C	
SOCIAL SCIENCE TEACHERS, N.E.C. 000.227-000	126	8	6	5	5	1	1	2	3	3	2	4	4	4	5	5	L
ENGINEERING TEACHERS 000.227-000	127	8	6	5	5	1	1	2	2	2	2	3	3	3	5	4	L
MATHEMATICAL SCIENCE TEACHERS 000.227-000	128	8	6	5	5	1	1	2	3	3	2	4	4	4	5	5	L
COMPUTER SCIENCE TEACHERS 000.227-000	129	8	6	5	5	1	1	2	3	3	2	4	4	4	5	5	L
MEDICAL SCIENCE TEACHERS 000.227-000	133	8	6	6	6	1	1	2	1	2	2	3	2	2	5	4	L
AGRICULTURE AND FORESTRY TEACHERS 000.227-000	136	8	6	6	6	1	1	2	3	3	2	3	3	3	5	4	L
EDUCATION TEACHERS 000.227-000	139	7	6	5	5	1	1	2	3	3	2	4	4	4	5	5	L
ENGLISH TEACHERS 000.227-000	143	7	6	5	6	1	1	2	3	3	2	4	4	4	5	5	L
LAW TEACHERS 000.227-000	145	8	6	5	6	1	1	1	3	3	2	4	4	4	5	5	L
SOCIAL WORK TEACHERS 000.227-000	146	7	6	5	5	1	1	2	3	3	2	4	4	4	5	5	L
THEOLOGY TEACHERS 000.227-000	147	8	6	5	6	1	1	2	3	3	2	4	4	4	5	5	L
TRADE AND INDUSTRIAL TEACHERS 000.227-000	148	7	6	5	5	1	1	2	2	2	2	3	3	3	3	3	L
HOME ECONOMICS TEACHERS 000.227-000	149	8	6	5	5	1	1	2	3	3	2	3	3	3	4	3	L
AIRCRAFT ENGINE MECHANICS 000.281-000	508	7	4	4	4	3	3	3	2	2	4	3	3	2	4	4	M
SHEETMETAL DUCT INSTALLERS 000.361-000	596	4	3	3	3	3	4	4	3	3	4	3	3	3	4	5	M
FAMILY CHILD CARE PROVIDERS 000.677-000	466	3	3	2	3	4	4	4	4	4	4	4	4	4	4	5	M
EARLY CHILDHOOD TEACHER'S ASSISTANTS 000.677-000	467	3	3	2	3	4	4	4	4	4	4	4	4	4	4	5	M
NOT SPECIFIED MECHANICS AND REPAIRERS 000.684-000	549	4	3	2	2	3	4	4	3	3	4	3	3	3	5	5	M
MACHINE OPERATORS, NOT SPECIFIED 000.685-000	779	3	2	1	2	4	4	4	4	4	4	4	4	3	5	5	M

Database Errors

Due to its voluminous nature, the database data provided by the Department of Labor is found to contain several errors. In an effort to correct some of these errors, data for some DOT numbers were changed as follows:

<u>DOT TITLE DOT NUMBER</u>	<u>ERROR</u>	<u>CORRECTION</u>
Immunohematologist 078.221-010	Not cross-walked to any CCN	Renumbered DOT 078.261 -046; IMMUNOHEMATOLOGIST to 078.221-010 to coincide with DOT manuals.
Immunohematologist 078.261-046	Not in DOT Cross walked to CCN 208	Renumbered to 078.221-010 to coincide with DOT manuals.
Inst., Business Ed 090.222-010	Assigned to CCN 159	Reassigned to CCN 135 - Business, Commerce & Marketing Teachers
Teacher, Industrial Arts 091.221-010	Assigned to CCN 157	Reassigned to CCN 148 - Trade & Industrial Teachers
Instructor, Physical Education 099.224-010	Assigned to CCN 159	Reassigned to CCN 138 - Physical Education Teacher
Teacher, Art 149.021-010	Assigned to CCN 159	Reassigned to CCN 137 - Art, Drama & Music Teachers
Teacher, Drama 150.027-014	Assigned to CCN 159	Reassigned to CCN 137 - Art, Drama & Music Teachers
Teacher, Music 152.021-010	Assigned to CCN 159	Reassigned to CCN 137 - Art, Drama & Music Teachers
Consultant 189.167-010	Assigned to CCN 000	Assigned to CCN 037 - Management Related Occupations N.E.C.