

THE U.S. HEALTH WORKFORCE CHARTBOOK

Technical Documentation

U.S. Department of Health and Human Services
Health Resources and Services Administration
National Center for Health Workforce Analysis



INTRODUCTION

The U.S. Health Workforce Chartbook provides extensive data on 35 health occupations. This document provides details on the data sources and methodology used in the Chartbook. There are five sections:

1. Data Sources;
2. Definitions;
3. Standard Error Calculation;
4. CIP-SOC Crosswalk of Codes Used for Data in the Chartbook; and
5. Degree Award Levels Counted in the Chartbook.

1. Data Sources

The following data sources were used to prepare *The U.S. Health Workforce Chartbook*:

- **2008 to 2010 American Community Survey (ACS) Public Use Microdata Sample (PUMS)**

The three-year 2008 to 2010 ACS PUMS file was analyzed to provide the estimated number of individuals within each selected health occupation, along with information pertaining to workforce settings (industry), and the demographic makeup of the occupation (i.e., sex, age, race, and ethnicity).¹

The ACS PUMS data were downloaded from the U.S. Census Bureau.² The 2008 to 2010 ACS data file is approximately a 3-percent sample of the U.S. population by combining the 1-percent samples in the 2008, 2009, and 2010 ACS. The ACS data are collected throughout each calendar year and represent the aggregate characteristics over a three-year period. There are 9,093,077 records in the three-year 2008 to 2010 ACS data file.

The three-year ACS PUMS file was used, rather than the most recent single-year ACS PUMS file, to have sufficient sample sizes. While many of the health care occupations included in this report have substantial sample sizes, some occupations have relatively small sample sizes. Sample size is particularly important when reporting on the demographics of the occupations and when reporting on the workforce by state, because the small sample sizes may lead to unreliable estimates.

- **Integrated Postsecondary Education Data System (IPEDS)**

The National Center for Education Statistics IPEDS Completions Survey 2010 was used to report on the number of post-secondary degrees and certificates awarded.³

¹U.S. Department of Commerce, U.S. Census Bureau, ACS: Public Use Microdata Sample (PUMS), 2008-2010. Available online at: www.census.gov/acs/www/data_documentation/public_use_microdata_sample.

²See U.S. Census Bureau at: www2.census.gov/acs2010_3yr/pums/. Also see U.S. Census Bureau. (2009, February). *A compass for understanding and using American Community Survey data: What PUMS data users need to know*. Washington, DC: U.S. Government Printing Office. Available online at: www.census.gov/acs/www/guidance_for_data_users/handbooks.

³U.S. Department of Education, National Center for Education Statistics, 2009-10 IPEDS Completions Survey.

Data from IPEDS on individuals completing educational programs in the 2009 to 2010 academic year were used to estimate new graduates entering health occupations. The National Center for Education Statistics, U.S. Department of Education, maintains IPEDS.⁴ IPEDS collects information from colleges, universities, and technical and vocational educational institutions that participate in federal student financial aid programs.

Each educational institution reports the number of students completing each curriculum program. Information includes the number of males and females and the number by race and ethnicity. The award level of the program is also noted. The information for 2010 in IPEDS was reported to discern the diversity of recent graduates. The type of program is coded according to the Classification of Instructional Program (CIP) coding scheme. When the 2011 CIP-SOC crosswalk, provided by the National Center for Education Statistics and the U.S. Bureau of Labor Statistics (BLS),⁵ was used, CIP codes were matched to SOC numbers to select the instructional programs analyzed for each health occupation. (See Section Four of this technical documentation for the CIP and SOC codes used for this Chartbook.)

The IPEDS data are used to estimate the number of students who, upon graduation, may be entering the occupation for the first time. However, this number is not known with certainty. New graduates in some educational programs in IPEDS, particularly those receiving advanced degrees, may already be practicing in the health occupation related to the curriculum. These students are advancing their education for the occupation but are not new recruits.

For most occupations, IPEDS data are reported at the associate's degree level or above. However, for certain occupations, a certification program involving coursework of less than one year, or more than one year but less than two years, is a major point of entry. The data for individuals completing these certification programs were reported. No graduate data are presented for occupations in which formal educational requirements are completed in institutions not reporting to IPEDS or vary substantially by state. (See Section Five of this technical documentation for the degree award levels used for this Chartbook.)

Percentages were calculated from the aggregate numbers reported within each sex and race and ethnicity category. Institutions could report the race and ethnicity using one of two sets of aggregate categories.⁶ In some cases, institutions may not have collected information on a student at initial enrollment using the present scheme that includes a category for multiple races. In other cases, reported race and ethnicity information included the category for multiple races.

Information on the educational requirements for the occupations in this report was also included. Details on these requirements can be found here: www.bls.gov/ooh.

- **The 2011 to 2012 Area Resource File (ARF)**

The ARF was used to report on three occupations for which ACS data were not available (i.e., nurse practitioners, nurse anesthetists, and nurse-midwives). The ARF is a county-level source of health workforce and health resources data. Included in the ARF are data from the American

⁴See <http://nces.ed.gov/ipeds>.

⁵See <http://nces.ed.gov/ipeds/cipcode/resources.aspx?v=55>.

⁶See "Resources for Implementing Changes to Race and Ethnicity Reporting in IPEDS" at: <http://nces.ed.gov/ipeds/reic/resource.asp>.

College of Nurse-Midwives and the Centers for Medicare & Medicaid Services' National Provider Identification (NPI) file. The NPI contains data on health professionals who require unique identification for federal billing (e.g., Medicare and Medicaid), private insurance, and other purposes.

2. Definitions

The occupations included in this report were selected according to the following criteria: (1) the occupation is among those with the largest number of jobs as identified by the SOC code, (2) the occupation is among the fastest-growing occupations as projected by the BLS, and/or (3) the occupation is among the top 35 occupations that have adequate data (i.e., sample sizes) available in the three-year 2008 to 2010 ACS PUMS file. These determinations were made based on data from the BLS Occupational Employment Statistics May 2010 National Employment and Wage Estimates.

Some important components of the health workforce are not included or fully represented in the Chartbook, because of data limitations. For instance, while nurses, the largest portion of the public health workforce, are included in the Chartbook, epidemiologists and other public health-oriented disciplines, such as laboratorians and environmental health professionals, are not included because of the small size of the occupation and lack of ACS data.

The “workforce” is defined as individuals employed in the occupation and individuals whose last job was in the occupation and who are still seeking employment (e.g., individuals unemployed because they were laid off but are still seeking employment). The 2008 to 2010 ACS PUMS has a variable that distinguishes between non-working individuals in the workforce and those no longer in the workforce. Only working-age individuals in the workforce are included in the Chartbook. State workforce estimates are based on the reported location for place of work; when place of work is not reported, state of residence is used.

Demographic information presented in the Chartbook includes sex, race, ethnicity, and age. The race and ethnicity categories reported are White (non-Hispanic), Black/African American (non-Hispanic), Hispanic, Asian/Native Hawaiian/Pacific Islander (non-Hispanic), American Indian/Alaska Native (non-Hispanic), and Multiple/Other Race (non-Hispanic).⁷ Race and ethnicity data in the ACS are reported according to standards defined by the Office of Management and Budget.⁸ Some race and ethnicity categories were combined to allow sufficient data for reporting. Specifically, the Native Hawaiian/Pacific islander subgroup was combined with the Asian subgroup because of small sample sizes across most health occupations for Native Hawaiians/Pacific Islanders. This grouping may mask differences between Asians and Native Hawaiian/Pacific Islanders in the data presented. Also, age groups reported are younger than 35 years old, 35 to 55 years old, and older than 55 years old.

⁷This category scheme for analysis of race and ethnicity is commonly used to capture Hispanic as an ethnicity apart from race among non-Hispanics. See, for example, the use of this reporting scheme in U.S. Department of Health and Human Services, Health Resources and Services Administration. (2010). *Women's health USA 2010*. Rockville, MD: Author. Available online at: <http://mchb.hrsa.gov/whusa10/pdfs/w08.pdf>. Analysis of the race categories of Hispanics in the health occupations in this report revealed that 27 percent were “other single race alone” and 4 percent were “multiple races.” That is, about one-third of the Hispanics did not select any of the defined single race categories.

⁸See <http://minorityhealth.hhs.gov/templates/browse.aspx?lvl=2&lvlID=172>.

Work settings reported for an occupation include all those that represent more than 3 percent of total employment for that occupation. These settings are classified by industry and are organized as part of the North American Industry Classification System (NAICS). More detailed information on the work settings used in this report can be found on the U.S. Census Bureau website at www.census.gov/eos/www/naics.

The U.S. population estimates of the age groups and the race and ethnicity and sex distributions were derived from the 2008 to 2010 ACS PUMS for the population 16 years of age or older to represent the working-age population. The population estimates from the 2008 to 2010 ACS PUMS represent the average annual population distributions for the three-year period, 2008 through 2010. This measure is consistent with the estimates for each occupation based on the 2008 to 2010 ACS.

3. Standard Error (SE) Calculation

The 2008 to 2010 three-year ACS public use file contains 80 replicate weights for direct calculation of SEs. As stated in documentation for the 2008 to 2010 three-year ACS PUMS: “The standard error of X can be computed after the replicate estimates X_1 through X_{80} are computed [using each replicate weight]. The SE is estimated using the sum of squared differences between each replicate estimate X_r and the full sample estimate X .”⁹

The SE formula using replicate weights is:

$$SE(X) = \sqrt{\left(\frac{4}{80}\right) \sum_{r=1}^{80} (X_r - X)^2}$$

In the SAS statistical software package, there are two methods of calculating SEs using replicate weights: (1) the jackknife method and (2) balance repeated replication (BRR). When the jackknife method is used for the formula above, the code for a crosstab procedure is¹⁰:

```
PROC SURVEYFREQ DATA = XXX VARMETHOD=jackknife;
TABLES AA * BB / VARWT CLWT CVWT;
ODS OUTPUT TABCROSS =AASUM;
BY CAT VARNAME;
WEIGHT PWGTP;
REPWEIGHT PWGTP1-PWGTP80 /JKCOEFS=0.05;
RUN;
```

Where PWGTP is the name of the person weight variable in the ACS PUMS data file and PWGTP1-PWGTP80 are the names of the respective replicate weight variables. The OPTION of JKCOEFS=0.05 under REPWEIGHT statement adjusts for the “4/80” in the formula. The jackknife method was used to produce the SEs of estimates.¹¹

⁹U.S. Census Bureau. 2008-2010 PUMS Accuracy of the Data. Available online at:

www.census.gov/acs/www/Downloads/data_documentation/pums/Accuracy/2008_2010AccuracyPUMS.pdf.

¹⁰See U.S. Census Bureau. Estimating ASEC Variances with Replicate Weights. Available at the link “Estimating ASEC Variances with Replicate Weights” on the web page at: <http://usa.ipums.org/usa/repwt.shtml>.

¹¹U.S. Census Bureau. (2008, October). Chapter 4: Accuracy of the microdata sample estimates and Table E: Census 2000 PUMS standard error design factors—United States. In *Technical documentation: Census 2000, Public Use Microdata Sample (PUMS)*. Washington, DC: U.S.

Suppression of Data and Relative Standard Error (RSE)

The RSE of an estimate is found by dividing the SE by the estimate. This proportion provides an idea of how reliable an estimate is; the greater the RSE, the less reliable the estimate. For the ACS data, the RSE was calculated by dividing the weighted estimates by their SEs. The RSE was multiplied by 100 so that it could be represented as a percent relative standard error (PRSE). The RSE or PRSE can be used to determine a threshold for indicating that data are unreliable or for suppressing data entirely.

Throughout the report, estimates with a PRSE of less than 20 percent were displayed in various charts, tables, and maps. For the national maps, data were shown for states with estimates with a PRSE between 20 percent and 29 percent, along with overlaying dots indicating that the PRSE for those states fell within that range. If a state has a PRSE of 30 percent or greater, its data were not shown and the symbol on the map was indicated as “Not Reportable.” For the national bar and pie charts, estimates with a PRSE between 20 percent and 29 percent were shown with an asterisk (or two asterisks) next to the estimate in the chart, indicating that the PRSE fell within that range. If an estimate has a PRSE of 30 percent or greater, its data were not shown and is appropriately noted with an asterisk or two asterisks.

4. CIP-SOC CROSSWALK OF CODES USED FOR DATA IN THE CHARTBOOK

Occupation	Standard Occupational Classification (SOC) Code	IPEDS Classification of Instructional Program (CIP) Code
Part I: Clinicians		
Physicians	29-1060	51.1201 Medicine 51.1901 Osteopathic Medicine/Osteopathy
Physician Assistants	29-1071	51.0912 Physician Assistant
Registered Nurses ¹²	29-1111 (ACS SOC 2000) 29-1141 (ACS SOC 2010)	51.3801 Registered Nursing/Registered Nurse 51.3802 Nursing Administration 51.3803 Adult Health Nurse/Nursing 51.3805 Family Practice Nurse/Nursing 51.3806 Maternal/Child Health and Neonatal Nurse/Nursing 51.3808 Nursing Science 51.3809 Pediatric Nurse/Nursing 51.3810 Psychiatric/Mental Health Nurse/Nursing 51.3811 Public Health/Community Nurse/Nursing 51.3812 Perioperative/Operating Room and Surgical Nurse/Nursing 51.3814 Critical Care Nursing 51.3815 Occupational and Environmental Health Nursing 51.3816 Emergency Room/Trauma Nursing 51.3818 Nursing Practice 51.3819 Palliative Care Nursing 51.3820 Clinical Nurse Leader 51.3821 Geriatric Nurse/Nursing 51.3822 Women's Health Nurse/Nursing 51.3899 Registered Nursing, Nursing Administration, Nursing Research and Clinical Nursing, Other
Nurse Anesthetists	NA	NA
Nurse-Midwives	NA	NA
Nurse Practitioners	NA	NA

¹²Although several nursing programs are included in the CIP codes for Registered Nurses, please be cognizant of the educational levels for RNs that are reported in the Chartbook. These educational levels can be found in Part V of this technical documentation.

Occupation	Standard Occupational Classification (SOC) Code	IPEDS Classification of Instructional Program (CIP) Code
Licensed Practical and Licensed Vocational Nurses	29-2061	51.3901 Licensed Practical/Vocational Nurse Training
Dentists	29-1020 (Dentists) or if not available 29-1021 (Dentists, General)	51.0401 Dentistry
Dental Hygienists	29-2021	51.0602 Dental Hygiene/Hygienist
Dental Assistants	31-9091	NA
Pharmacists	29-1051	51.2001 Pharmacy
Part II: Clinicians and Health Administration		
Chiropractors	29-1011	51.0101 Chiropractic
Optometrists	29-1041	51.1701 Optometry
Opticians, Dispensing	29-2081	NA
Medical and Health Services Managers	11-9111	51.0701 Health/Health Care Administration/Management 51.0702 Hospital and Health Care Facilities Administration/Management 51.0704 Health Unit Manager/Ward Supervisor 51.0705 Medical Office Management/Administration 51.0718 Long Term Care Administration/Management 51.2211 Health Services Administration
Medical Secretaries	43-6010 (Secretaries and Administrative Assistants) where NAICS Industry Code is Medical Setting	NA
Veterinarians	29-1131	51.2401 Veterinary Medicine

Part III: Technologists and Technicians and Aides and Assistants		
Medical and Clinical Laboratory Technologists and Technicians	29-2010	51.1002 Cytotechnology/Cytotechnologist 51.1005 Clinical Laboratory Science/Medical Technology/Technologist 51.1007 Histologic Technology/Histotechnologist 51.1010 Cytogenetics/Genetics/Clinical Genetics Technology/Technologist 51.0802 Clinical/Medical Laboratory Assistant 51.1001 Blood Bank Technology Specialist 51.1003 Hematology Technology/Technician 51.1004 Clinical/Medical Laboratory Technician 51.1008 Histologic Technician 51.1099 Clinical/Medical Laboratory Science and Allied Professions, Other
Diagnostic Related Technologists and Technicians	29-2030	51.0901 Cardiovascular Technology/Technologist 51.0902 Electrocardiograph Technology/Technician 51.0906 Perfusion Technology/Perfusionist 51.0915 Cardiopulmonary Technology/Technologist 51.0905 Nuclear Medical Technology/Technologist 51.0910 Diagnostic Medical Sonography/Sonographer and Ultrasound Technician 51.0907 Medical Radiologic Technology/Science - Radiation Therapist 51.0911 Radiologic Technology/Science - Radiographer 51.0919 Mammography Technician/Technology 51.0920 Magnetic Resonance Imaging (MRI) Technology/Technician
Emergency Medical Technicians and Paramedics	29-2041	NA
Health Diagnosing and Treating Practitioner Support Technologists and Technicians	29-2050	19.0501 Foods, Nutrition, and Wellness Studies, General 30.1901 Nutrition Sciences 51.3103 Dietetic Technician 51.3104 Dietitian Assistant 51.0805 Pharmacy Technician/Assistant 51.1502 Psychiatric/Mental Health Services Technician 51.0812 Respiratory Therapy Technician/Assistant 51.0811 Pathology/Pathologist Assistant 51.0909 Surgical Technology/Technologist 51.0808 Veterinary/Animal Health Technology/Technician/Veterinary Assistant

Medical Records and Health Information Technicians	29-2071	51.0706 Health Information/Medical Records Administration/Administrator 51.0707 Health Information/Medical Records Technology/Technician
Medical Assistants and Other Healthcare Support Occupations	31-909x Medical Assistants and Other Healthcare Support Occupations, Except Dental Assistants (ACS SOC 2000) 31-9092 Medical Assistants 31-9094 Medical Transcriptionists 31-9095 Pharmacy Aides 31-9096 Veterinary Assistants and Laboratory Animal Caretakers 31-9097 Phlebotomists 31-909x Healthcare Support Workers, All Other, Including Medical Equipment Preparers (ACS SOC 2010)	NA
Personal Care Aides	39-9021	NA
Nursing, Psychiatric, and Home Health Aides	31-1010 (ACS SOC 2000/2010)	NA
Part IV: Behavioral and Allied Health		
Psychologists	19-3030	42.0101 Psychology, General 42.2703 Developmental and Child Psychology 42.2801 Clinical Psychology 42.2803 Counseling Psychology 42.2805 School Psychology 42.2807 Clinical Child Psychology 42.2809 Geropsychology 42.2810 Health/Medical Psychology 42.2814 Applied Behavior Analysis

Counselors	21-1010 where NAICS Industry Code is Medical/Health Setting and Individual and Family Services	51.1501 Substance Abuse/Addiction Counseling 51.1505 Marriage and Family Therapy/Counseling 51.1506 Clinical Pastoral Counseling/Patient Counseling 51.1507 Psychoanalysis and Psychotherapy 51.1508 Mental Health Counseling/Counselor 51.2310 Vocational Rehabilitation Counseling/Counselor
Social Workers	21-1020 where NAICS Industry Code is Medical/Health Setting and Individual and Family Services	44.0701 Social Work 44.0702 Youth Services/Administration 44.0799 Social Work, Other 51.1503 Clinical/Medical Social Work
Physical Therapists	29-1123	51.2308 Physical Therapy/Therapist
Physical Therapist Assistants and Aides	31-2020	NA
Occupational Therapists	29-1122	51.2306 Occupational Therapy/Therapist
Respiratory Therapists	29-1126	51.0908 Respiratory Care Therapy/Therapist
Speech-Language Pathologists	29-1127	51.0201 Communication Sciences and Disorders, General 51.0203 Speech-Language Pathology/Pathologist 51.0204 Audiology/Audiologist and Speech-Language Pathology/Pathologist 51.0299 Communication Disorders Sciences and Services, Other
Massage Therapists	31-9011	NA
Dietitians and Nutritionists	29-1031	51.3101 Dietetics/Dietitian 51.3102 Clinical Nutrition/Nutritionist 51.3199 Dietetics and Clinical Nutrition Services, Other

Note: NA in the SOC column means that information for this occupation is “Not Available” and another data source was used for this occupation. NA in the IPEDS column means “Not Applicable” because no specific educational pathway could be presented for this occupation.

More information on SOC codes can be found here: www.bls.gov/soc.

5. DEGREE AWARD LEVELS COUNTED IN THE CHARTBOOK

Occupation	Degree Award Level
Physicians	doctoral
Physician Assistants	associate's, bachelor's, master's
Registered Nurses	associate's, bachelor's
Licensed Practical and Licensed Vocational Nurses	at least one but less than two years, associate's
Dentists	doctoral
Dental Hygienists	associate's, bachelor's
Pharmacists	doctoral
Veterinarians	doctoral
Chiropractors	doctoral
Optometrists	doctoral
Psychologists	master's, doctoral
Counselors	bachelor's, master's
Social Workers	bachelor's, master's
Physical Therapists	master's, doctoral
Physical Therapist Assistants	associate's
Occupational Therapists	bachelor's, master's
Respiratory Therapists	associate's, bachelor's
Speech-Language Pathologists	bachelor's, master's
Dietitians and Nutritionists	bachelor's
Medical and Health Services Managers	bachelor's, master's
Medical and Clinical Laboratory Technologists and Technicians	associate's, bachelor's
Diagnostic Related Technologists and Technicians	associate's, bachelor's
Health Diagnosing and Treating Practitioner Support Technologists and Technicians	associate's, bachelor's, master's
Medical Records and Health Information Technicians	at least one but less than two years, associate's

