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Using the ODS Report Writing Interface to Streamline Publication of Existing Reports with Complex Tables

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ABSTRACT

This paper examines the SAS® Output Delivery System (ODS) Report Writing Interface (RWI) to streamline the publication process of "*Health, United States*", an annual report on health and health care in the United States. The report's tables contain multiple nested categories within rows and columns and are suitable for printing (PDF) and downloading (Microsoft Excel). The publication process from SAS datasets currently involves several labor-intensive steps. In addition, Section 508 of the Rehabilitation Act of 1973 requires all federal agency website content to be accessible to people with disabilities. The process of manually labeling content for screen readers ("tagging") presents an additional challenge for these complex nested tables.

The publishing process is being automated and the output delivery is being enhanced using the RWI. The ODS templates and Cascading Style Sheets are used to standardize the format of the output and varied formatting using conditional processing. This approach maintains the existing output formats while limiting the manual processing, decreasing production time, and increasing quality. This approach allows automated production of a variety of file formats including PDF, HTML5, and Excel. Using the RWI and SAS accessibility features, most of the manual Section 508 compliance task of the output should be eliminated. This paper will highlight these proposed changes for production of *"Health, United States* 2017*."*

INTRODUCTION

Health, United States (https://www.cdc.gov/nchs/hus/index.htm) is an annual report about the health status of people living in the United States. It is submitted by the Secretary of the United States Department of Health and Human Services (HHS) to the President and the Congress. The report is prepared by the principal health statistics agency of the federal government, the National Center for Health Statistics (NCHS).

The *Health, United States* 2018 Chartbook compiles multiple topics of public interest and policy relevance. The 47 supplementary online-only trend tables are complex, involving multiple nested categorical values within rows and columns. Producing this report is a complex effort and involves multiple levels of review and scrutiny, with iterative manual proofing and quality control checks. Automating the production of the trend tables would result in a more streamlined process with improved accuracy.

Health, United States trend tables are available online as Microsoft (MS) Excel tables and as individual PDF documents that must be 508 compliant. Section 508 is an amendment to the Rehabilitation Act of 1973 that requires Federal agencies to make their Electronic and Information Technology (EIT) accessible to people with disabilities (https://www.section508.gov/).

This paper presents a case study using the SAS Output Delivery System (ODS) Report Writing Interface (RWI) to streamline the production process of the *Health, United States* trend tables. The 2017 *Health, United States* "Table 1. Resident population, by age, sex,

race, and Hispanic origin: United States, selected years 1950–2016” was used to demonstrate these capabilities. ODS templates, Cascading Style Sheets (CSSs), in-line formatting, and Unicode characters were used to duplicate the formatting of the existing PDF trend table documents. The RWI DATA _NULL_ table generation methods were used to create the trend tables with the nested row and column headers, footnote reference marks, data placement, and conditional formatting. Using the same RWI code, the trend tables can be output in various file formats with minimal code changes. The generation of the existing PDF files as well as HTML5 as a replacement for the existing Excel file format are demonstrated.

The results of this case study using the SAS RWI with various formatting and accessibility features are expected to streamline production processes while ensuring accuracy of the overall output.

HEALTH, UNITED STATES TREND TABLES – CURRENT PRODUCTION

Health, United States is currently being redesigned, which creates opportunities to update the process for generating the trend tables. The current production process involves several manual steps. The team is looking into new ways to produce these tables in a more automated way. While maintaining the 508 compliant PDF files of the past, the team is also interested in providing the data in more user-friendly digital formats for screen readability and ease of data download and import to various software.

Dynamic Data Exchange (DDE) is a key component of the current trend table generation process. DDE is a Microsoft (MS) method of inter-process communication, introduced for Windows in 1987, allowing SAS to communicate with MS Excel. DDE is the method currently used in the production of the *Health, United States* trend tables to output data from SAS datasets into preformatted Excel spreadsheets (table "shells"). These spreadsheets are later used to generate the PDF files for publication. DDE continues to work even in modern versions of Windows but has been superseded by newer technologies. When updates to related software are applied, DDE sometimes requires coding or configuration modifications.

The current process of generating annual updates to trend tables in *Health, United States* that is being redesigned involves the following:

1. Create SAS dataset of estimates for latest year of data using SAS and SAS-callable SUDAAN
2. Update an existing MS Excel spreadsheet to add blank rows and columns to accept new data values
3. Update SAS programs using DDE to point to appropriate rows and columns in Excel file to output the new data
4. Review the file manually to confirm that the appropriate values are entered in the appropriate table cells
5. Create PDF documents from the Excel file using third-party software
6. Manually review and tag the PDF to be Section 508 compliant

Publish the PDF file and Excel format fileThe *Health, United States* Trend Tables are currently published to the *Health, United States* website in 2 formats:

- Excel files that include all existing / historical data available. These are designed for readability on a screen but are not suitable for 8 ½ x 11" printing.
- PDF files that include a subset of the data, with only some years selected for printing. These are suitable for 8 ½ x 11" printing.

HEALTH, UNITED STATES TREND TABLE (PDF FORMAT).

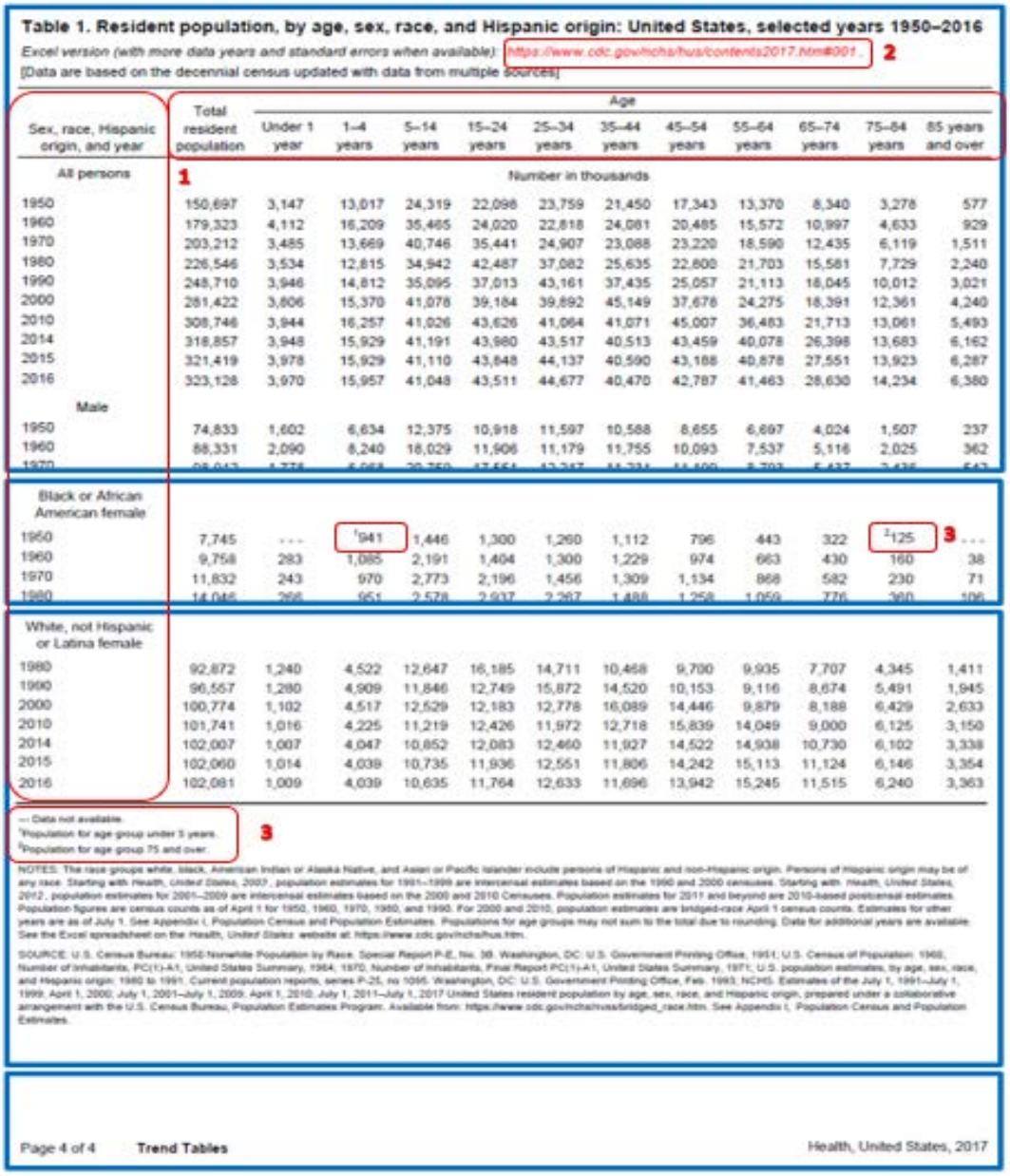


Table 1. Resident population, by age, sex, race, and Hispanic origin: United States, selected years 1950–2016

Excel version (with more data years and standard errors when available): https://www.cdc.gov/nchs/hus/contents2017.htm#001. **2**

[Data are based on the decennial census updated with data from multiple sources]

Sex, race, Hispanic origin, and year	Total resident population	Age										
		Under 1 year	1–4 years	5–14 years	15–24 years	25–34 years	35–44 years	45–54 years	55–64 years	65–74 years	75–84 years	85 years and over
All persons **1**	Number in thousands											
1950	150,697	3,147	13,017	24,319	22,098	23,759	21,450	17,343	13,370	8,340	3,278	577
1960	179,323	4,112	16,209	35,465	24,020	22,818	24,081	20,485	15,572	10,997	4,633	929
1970	203,212	3,485	13,669	40,746	35,441	24,907	23,088	23,220	18,590	12,435	6,119	1,511
1980	226,546	3,534	12,815	34,942	42,487	37,082	25,635	22,600	21,703	15,581	7,729	2,240
1990	248,710	3,946	14,812	35,095	37,013	43,161	37,435	25,057	21,113	18,045	10,012	3,021
2000	281,422	3,806	15,370	41,078	39,184	39,892	45,149	37,678	24,275	18,391	12,361	4,240
2010	308,746	3,944	16,257	41,026	43,626	41,064	41,071	45,007	36,483	21,713	13,061	5,493
2014	318,857	3,948	15,929	41,191	43,980	43,517	40,513	43,459	40,078	26,398	13,683	6,162
2015	321,419	3,978	15,929	41,110	43,848	44,137	40,590	43,188	40,878	27,551	13,923	6,287
2016	323,128	3,970	15,957	41,048	43,511	44,677	40,470	42,787	41,463	28,630	14,234	6,380
Male												
1950	74,833	1,602	6,634	12,375	10,918	11,597	10,588	8,655	6,697	4,024	1,507	237
1960	88,331	2,090	8,240	18,029	11,906	11,179	11,755	10,093	7,537	5,116	2,025	362
1970	[illegible]											
Black or African American female												
1950	7,745	...	[1]941	1,446	1,300	1,260	1,112	796	443	322	[2]125 **3**	...
1960	9,758	283	1,085	2,191	1,404	1,300	1,229	974	663	430	160	38
1970	11,832	243	970	2,773	2,196	1,456	1,309	1,134	868	582	230	71
1980	14,046	266	951	2,578	2,937	2,267	1,488	1,258	1,059	776	360	106
White, not Hispanic or Latina female												
1980	92,872	1,240	4,522	12,647	16,185	14,711	10,468	9,700	9,935	7,707	4,345	1,411
1990	96,557	1,280	4,909	11,846	12,749	15,872	14,520	10,153	9,116	8,674	5,491	1,945
2000	100,774	1,102	4,517	12,529	12,183	12,778	16,089	14,446	9,879	8,188	6,429	2,633
2010	101,741	1,016	4,225	11,219	12,426	11,972	12,718	15,839	14,049	9,000	6,125	3,150
2014	102,007	1,007	4,047	10,852	12,083	12,460	11,927	14,522	14,938	10,730	6,102	3,338
2015	102,060	1,014	4,039	10,735	11,936	12,551	11,806	14,242	15,113	11,124	6,146	3,354
2016	102,081	1,009	4,039	10,635	11,764	12,633	11,696	13,942	15,245	11,515	6,240	3,363

— Data not available.
[1]Population for age group under 5 years.
[2]Population for age group 75 and over. **3**

NOTES: The race groups white, black, American Indian or Alaska Native, and Asian or Pacific Islander include persons of Hispanic and non-Hispanic origin. Persons of Hispanic origin may be of any race. Starting with *Health, United States, 2003*, population estimates for 1991–1999 are intercensal estimates based on the 1990 and 2000 censuses. Starting with *Health, United States, 2012*, population estimates for 2001–2009 are intercensal estimates based on the 2000 and 2010 Censuses. Population estimates for 2011 and beyond are 2010-based postcensal estimates. Population figures are census counts as of April 1 for 1950, 1960, 1970, 1980, and 1990. For 2000 and 2010, population estimates are bridged-race April 1 census counts. Estimates for other years are as of July 1. See Appendix I, Population Census and Population Estimates. Populations for age groups may not sum to the total due to rounding. Data for additional years are available. See the Excel spreadsheet on the *Health, United States* website at: https://www.cdc.gov/nchs/hus.htm.

SOURCE: U.S. Census Bureau: 1950 Nonwhite Population by Race, Special Report P-E, No. 3B. Washington, DC: U.S. Government Printing Office, 1951; U.S. Census of Population: 1960, Number of Inhabitants, PC(1)-A1, United States Summary, 1964; 1970, Number of Inhabitants, Final Report PC(1)-A1, United States Summary, 1971; U.S. population estimates, by age, sex, race, and Hispanic origin: 1980 to 1991. Current population reports, series P-25, no 1095. Washington, DC: U.S. Government Printing Office, Feb. 1993; NCHS. Estimates of the July 1, 1991–July 1, 1999; April 1, 2000; July 1, 2001–July 1, 2009; April 1, 2010; July 1, 2011–July 1, 2017 United States resident population by age, sex, race, and Hispanic origin, prepared under a collaborative arrangement with the U.S. Census Bureau, Population Estimates Program. Available from: https://www.cdc.gov/nchs/nvss/bridged_race.htm. See Appendix I, Population Census and Population Estimates.

Page 4 of 4 **Trend Tables** Health, United States, 2017

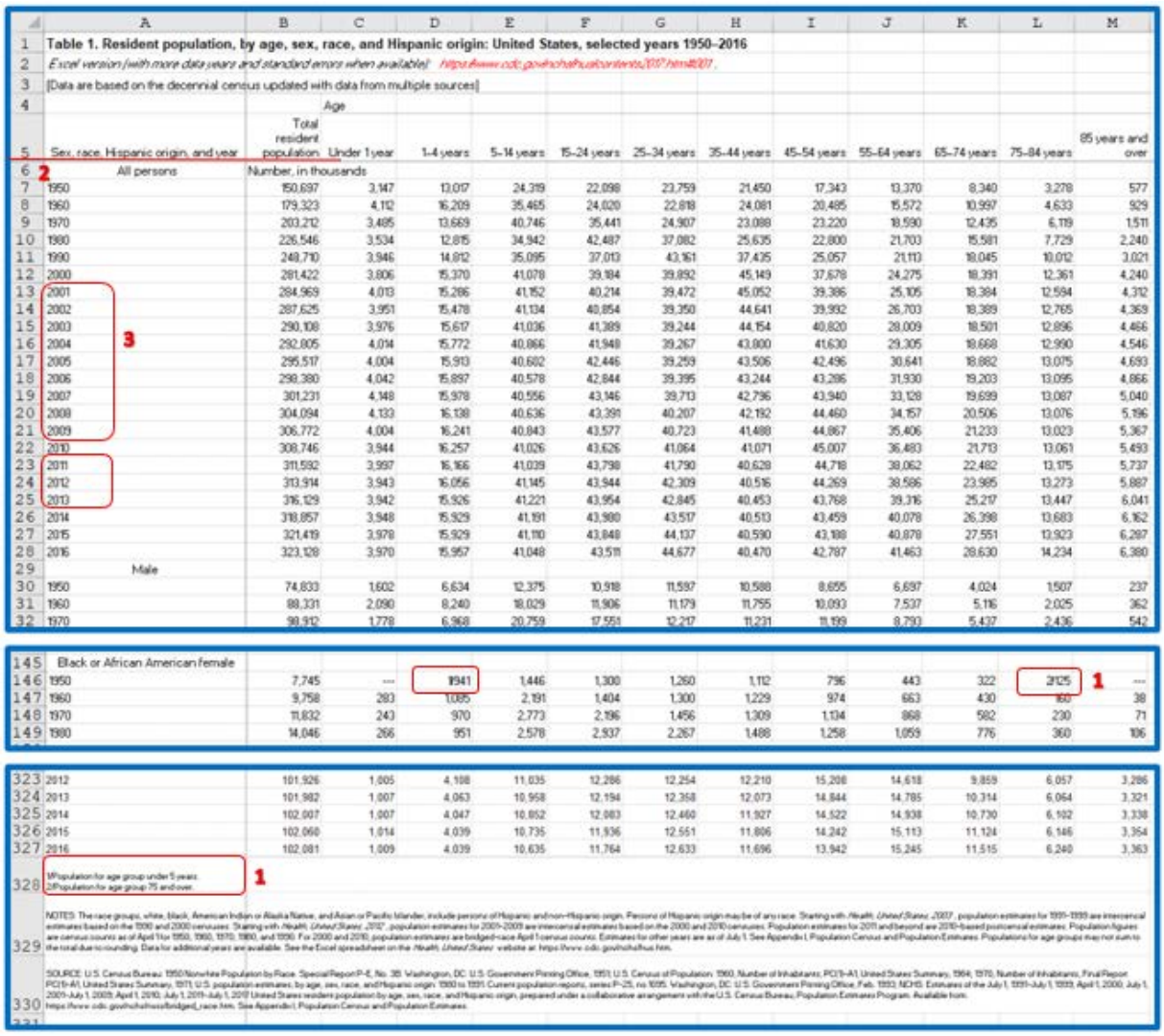
Figure 1. Sample of Existing PDF Trend Table (Sections of Table 1)

As seen in Figure 1, the current Table 1 PDF version of *Health, United States* has

- A data table with multiple levels of row and column headers **(1)**
- A hyperlink to the website where both Excel and PDF files are available **(2)**
- A footnotes section at the bottom of the last page with citations embedded with data **(3)**

All these components of the table involve varying fonts (style & size) as well as custom header, footer, and data placement.

HEALTH, UNITED STATES TREND TABLE (EXCEL FORMAT)



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table 1. Resident population, by age, sex, race, and Hispanic origin: United States, selected years 1950–2016**												
2	*Excel version (with more data years and standard errors when available)* https://www.cdc.gov/nchs/hus/contents/2017.htm#tbl01 .												
3	[Data are based on the decennial census updated with data from multiple sources]												
4			Age										
5	Sex, race, Hispanic origin, and year	Total resident population	Under 1 year	1–4 years	5–14 years	15–24 years	25–34 years	35–44 years	45–54 years	55–64 years	65–74 years	75–84 years	85 years and over
6	2 All persons	Number, in thousands											
7	1950	150,697	3,147	13,017	24,319	22,098	23,759	21,450	17,343	13,370	8,340	3,278	577
8	1960	179,323	4,112	16,209	35,465	24,020	22,818	24,081	20,485	15,572	10,997	4,633	929
9	1970	203,212	3,485	13,669	40,746	35,441	24,907	23,088	23,220	18,590	12,435	6,119	1,511
10	1980	226,546	3,534	12,815	34,942	42,487	37,082	25,635	22,800	21,703	15,581	7,729	2,240
11	1990	248,710	3,946	14,812	35,095	37,013	43,161	37,435	25,057	21,110	18,045	10,012	3,021
12	2000	281,422	3,806	15,370	41,078	39,184	39,892	45,149	37,678	24,275	18,391	12,361	4,240
13	2001	284,969	4,013	15,286	41,152	40,214	39,472	45,052	39,386	25,105	18,384	12,594	4,312
14	2002	287,625	3,951	15,478	41,134	40,854	39,350	44,641	39,992	26,703	18,389	12,765	4,369
15	2003	290,108	3,976	15,617	41,036	41,389	39,244	44,154	40,820	28,009	18,501	12,896	4,466
16	2004 3	292,805	4,014	15,772	40,866	41,948	39,267	43,800	41,630	29,305	18,668	12,990	4,546
17	2005	295,517	4,004	15,913	40,682	42,446	39,259	43,506	42,496	30,641	18,882	13,075	4,693
18	2006	298,380	4,042	15,897	40,578	42,844	39,395	43,244	43,286	31,930	19,203	13,095	4,866
19	2007	301,231	4,148	15,978	40,556	43,146	39,713	42,796	43,940	33,128	19,699	13,087	5,040
20	2008	304,094	4,133	16,138	40,636	43,391	40,207	42,192	44,460	34,157	20,506	13,076	5,196
21	2009	306,772	4,004	16,241	40,843	43,577	40,723	41,488	44,867	35,406	21,233	13,023	5,367
22	2010	308,746	3,944	16,257	41,026	43,626	41,064	41,071	45,007	36,483	21,713	13,061	5,493
23	2011	311,592	3,997	16,166	41,039	43,738	41,790	40,629	44,718	38,062	22,482	13,175	5,737
24	2012	313,914	3,943	16,056	41,145	43,944	42,309	40,516	44,269	38,586	23,985	13,273	5,887
25	2013	316,129	3,942	15,926	41,221	43,954	42,845	40,453	43,768	39,316	25,217	13,447	6,041
26	2014	318,857	3,948	15,929	41,191	43,980	43,517	40,513	43,459	40,078	26,398	13,683	6,162
27	2015	321,419	3,978	15,929	41,110	43,848	44,137	40,590	43,188	40,878	27,551	13,923	6,287
28	2016	323,128	3,970	15,957	41,048	43,511	44,677	40,470	42,787	41,463	28,630	14,234	6,380
29	Male												
30	1950	74,833	1,602	6,634	12,375	10,918	11,597	10,588	8,655	6,697	4,024	1,507	237
31	1960	88,331	2,090	8,240	18,029	11,906	11,179	11,755	10,093	7,537	5,116	2,025	362
32	1970	98,912	1,778	6,968	20,759	17,551	12,217	11,231	11,199	8,793	5,437	2,436	542
145	Black or African American female												
146	1950	7,745	---	1941	1,446	1,300	1,260	1,112	796	443	322	2125 1	---
147	1960	9,758	283	1,085	2,191	1,404	1,300	1,229	974	663	430	160	38
148	1970	11,832	240	970	2,773	2,196	1,456	1,309	1,104	868	582	230	71
149	1980	14,046	266	951	2,578	2,937	2,267	1,488	1,258	1,059	776	360	106
323	2012	101,926	1,005	4,108	11,035	12,286	12,254	12,210	15,208	14,618	9,859	6,057	3,286
324	2013	101,982	1,007	4,063	10,958	12,194	12,358	12,073	14,844	14,785	10,314	6,064	3,321
325	2014	102,007	1,007	4,047	10,852	12,083	12,460	11,927	14,522	14,938	10,730	6,102	3,338
326	2015	102,060	1,014	4,039	10,735	11,936	12,551	11,806	14,242	15,113	11,124	6,146	3,354
327	2016	102,081	1,009	4,039	10,635	11,764	12,633	11,696	13,942	15,245	11,515	6,240	3,363
328	1Population for age group under 5 years. 2Population for age group 75 and over. 1												
329	NOTES: The race groups, white, black, American Indian or Alaska Native, and Asian or Pacific Islander, include persons of Hispanic and non-Hispanic origin. Persons of Hispanic origin may be of any race. Starting with *Health, United States, 2017*, population estimates for 1991–1999 are intercensal estimates based on the 1990 and 2000 censuses. Starting with *Health, United States, 2012*, population estimates for 2001–2009 are intercensal estimates based on the 2000 and 2010 censuses. Population estimates for 2011 and beyond are 2010-based postcensal estimates. Population figures are census counts as of April 1 for 1950, 1960, 1970, 1980, and 1990. For 2000 and 2010, population estimates are bridged-race April 1 census counts. Estimates for other years are as of July 1. See Appendix I, Population Census and Population Estimates. Populations for age groups may not sum to the total due to rounding. Data for additional years are available. See the Excel spreadsheet on the *Health, United States* website at https://www.cdc.gov/nchs/hus.htm.												
330	SOURCE: U.S. Census Bureau: 1950 Nonwhite Population by Race. Special Report P-E, No. 3B. Washington, DC: U.S. Government Printing Office, 1951; U.S. Census of Population: 1960, Number of Inhabitants, PC(1)-A1, United States Summary, 1964; 1970, Number of Inhabitants, Final Report PC(1)-A1, United States Summary, 1971; U.S. population estimates, by age, sex, race, and Hispanic origin: 1980 to 1991, Current population reports, series P-25, no. 1095. Washington, DC: U.S. Government Printing Office, Feb. 1993; NCHS. Estimates of the July 1, 1991–July 1, 1999, April 1, 2000, July 1, 2009–July 1, 2009, April 1, 2010, July 1, 2011–July 1, 2017 United States residents population by age, sex, race, and Hispanic origin, prepared under a collaborative arrangement with the U.S. Census Bureau, Population Estimates Program. Available from: https://www.cdc.gov/nchs/nvss/bridged_race.htm. See Appendix I, Population Census and Population Estimates.												

Figure 2. Sample of Existing Excel Trend Table (Sections of Table 1)

As seen in Figure 2, the current Excel version of Table 1 has:

- The same table structure as the PDF
- A footnotes section at the bottom of the last page with citations embedded with data **(1)**
- Custom header and data placement with various types of formatting
- Frozen header rows **(2)**

The Excel version of the trend tables are not in a "flat file" format of rows and columns, which would be ideal for data import to various software. Some tables contain additional years of data and standard errors not included in the PDF **(3)**

HEALTH, UNITED STATES TREND TABLES: REVISED PROCESS

This section presents a case study using the SAS Output Delivery System (ODS) Report Writing Interface (RWI) to streamline the production process of the *Health, United States* trend tables. Using the SAS RWI reduces much of the manual review and editing due to the automation it provides. Various output files including; PDF, HTML5, and Excel, referred to as ODS Destinations, can be created using the same code. There is no longer a need to use DDE, which is an outdated technology and no longer supported for use by SAS, for data transfer from SAS to Excel. The third-party software is no longer needed in this revised process to produce the PDF file from the Excel source file. The new process takes the data stored in SAS datasets and directly outputs the needed trend table output files. Lastly, the RWI provides an automated 508 compliance process which reduces the manual 508 compliance process.

CHANGES TO FILE TYPES

The new process would replicate the PDF produced by the current process and would create an HTML5 file instead of Excel, to increase screen readability and responsiveness to the tables accessed via a tablet or phone. Although not created through the use of the RWI, a comma-separated format (CSV) file would be produced as well to provide an open format file that can be easily downloaded by researchers wishing to use the trend table data as a source for further analysis using various software packages (e.g., R).

NEW PROCESS FOR ANNUAL REPORT GENERATION FOR EACH OF THE TREND TABLES

1. Create data file of estimates for latest year and append to the “Master” SAS dataset (containing historical data) for each trend table
2. Run the SAS program to generate the output reports: PDF & HTML5 (or Excel)
3. Output the “Master” SAS dataset into a CSV data file
4. Review the files for data, style, formatting, and 508 compliance

USING SAS TO CREATE THE CUSTOM REPORTS

SOURCE DATA

To output the source data in the desired format and order, for the new process, the data will need to be stored appropriately.

Sex, race, Hispanic origin, and year	Total resident population	Age										
		Under 1 year	1–4 years	5–14 years	15–24 years	25–34 years	35–44 years	45–54 years	55–64 years	65–74 years	75–84 years	85 years and over
All persons	Number, in thousands											
1950	150,697	3,147	13,017	24,319	22,098	23,759	21,450	17,343	13,370	8,340	3,278	577
1960	179,323	4,112	16,209	35,465	24,020	22,818	24,081	20,485	15,572	10,997	4,633	929
1970	203,212	3,485	13,669	40,746	35,441	24,907	23,088	23,220	18,590	12,435	6,119	1,511

Figure 3. Sample of Headers and Data Values to Load for Final Trend Table 1

The source data is stored in a SAS dataset. To make the various data group headers such as “All persons” or “Under 1 year” as seen in Figure 3 appear in the correct order; data headers and labels are stored as numbers and formats are used for the labels. “All persons” is listed first so it is stored as FORMAT_NAME: GROUP_NUM_001=0 as seen in Table 1 The formats, see Table 2, are then applied. This causes them to be listed in the correct order when sorted for the final table output. Table 3 shows a sample of the formatted data that will be used for the final output tables.

YEAR_001	GROUP_NUM_001	SUB_GROUP_NUM_001	COUNT_001
1950	0	0	150697
1950	0	1	3147
1950	0	2	13017
1950	0	3	24319
1950	0	4	22098
1950	0	5	23759
1950	0	6	21450
1950	0	7	17343

Table 1. Master Data (Unformatted Data Values)

FORMAT_NAME	VALUE	LABEL
GROUP_NUM_001F	0	All persons
GROUP_NUM_001F	1	Male
GROUP_NUM_001F	2	Female
GROUP_NUM_001F	3	White male
GROUP_NUM_001F	4	White female

SUB_GROUP_NUM_001F	0	Total Resident Population
SUB_GROUP_NUM_001F	1	Under 1 year
SUB_GROUP_NUM_001F	2	1- 4 years
SUB_GROUP_NUM_001F	3	5-14 years
SUB_GROUP_NUM_001F	4	15-24 years

Table 2. Sample of Formats

YEAR_001	GROUP_NUM_001	SUB_GROUP_NUM_001	COUNT_001	FOOTNOTES_001
1950	All persons	Total Resident Population	150,697	-
1950	All persons	Under 1 year	3,147	-
1950	All persons	1- 4 years	13,017	-
1950	All persons	5-14 years	24,319	-
1950	All persons	15-24 years	22,098	-
1950	All persons	25-34 years	23,759	-
1950	All persons	35-44 years	21,450	-
1950	All persons	45-54 years	17,343	-

Table 3. Master Data (with SAS Formats)

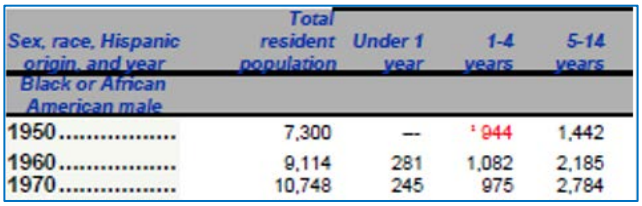
The PDF file contains fewer years of data, so the code includes a conditional section for the PDF file where those additional data rows are dropped from a work SAS dataset

STYLE CONTROL

To properly format the new files, to match or enhance the existing files, SAS ODS and the RWI includes many different options for formatting, all of which can be applied to all the output destinations including PDF, HTML5, and Excel. Some of these formatting options including: Unicode characters, in-line formatting, and Cascading Style Sheets (CSSs) with ODS templates, will be demonstrated below. Using the RWI, the tables can be designed with these various style controls and applied to all the file types with minimal additional coding.

Unicode Characters

Health, United States relies on footnotes throughout the trend tables to explain important details of the data and headers. If the footnotes are just stylized as superscripts, then copying and pasting the data may result in the superscript format being dropped and appearing as part of the numeric value. Instead, inputting the appropriate Unicode characters to represent the superscripted numbers preserves the formatting as an actual symbol character.



Sex, race, Hispanic origin, and year	Total resident population	Under 1 year	1-4 years	5-14 years
Black or African American male				
1950.....	7,300	---	¹ 944	1,442
1960.....	9,114	281	1,082	2,185
1970.....	10,748	245	975	2,784

Conditionally output Unicode Superscript and color data value Red if the Footnote flag is set as seen in Figure 4.

Figure 4. Sample NEW PDF Demonstrates Unicode Characters

The following code illustrates the use of formatting options including the Unicode (00B9) which is a superscript 1:

```
obj.format_cell(data:"^{unicode 00B9} "||
                        trim(left(put(age_cat_02,comma8.))),
                          style:'DataCells', just:'right',
                          style_attr:"color=red") ;
```

NOTE: using ^{super 1} instead of the Unicode returns a formatted superscript 1, not the Unicode character

ODS In-line Formatting

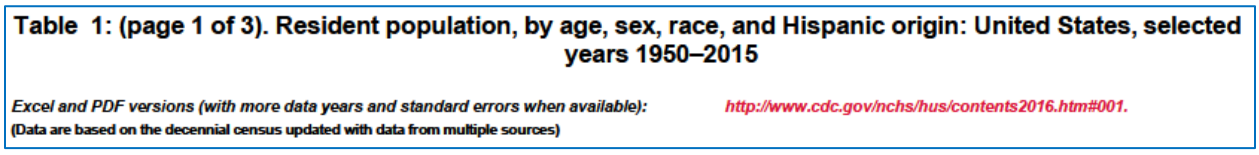


Table 1: (page 1 of 3). Resident population, by age, sex, race, and Hispanic origin: United States, selected years 1950–2015

Excel and PDF versions (with more data years and standard errors when available): *http://www.cdc.gov/nchs/hus/contents2016.htm#001.*
(Data are based on the decennial census updated with data from multiple sources)

Figure 5. Top of SAS Generated PDF Report for Table 1 of *Health, United States*

The header of the Table 1 report for *Health, United States* shown in Figure 5 demonstrates a few examples of in-line formatting. To use ODS in-line formatting, the first step is to assign an “escape character” which identifies the inline formatting symbol. This means the SAS compiler identifies the code following the escape character as in-line formatting code. The

user should select a seldom-used character to serve as an escape character. In this case the “caret” character “^” is used:

```
ODS escaprchar=”^” ;
```

To apply formatting in-line use the escape character followed by {style[*format attributes*] } all within the quotes. The following formats the first title:

```
title "^{style[font_face  ='Arial'
               font_size  =9pt
               just       =left
               background =white
              ] Table  1: (page  ^{thispage} of  ^{lastpage}) ......
         }" ;
```

The following creates a clickable hyperlink in red:

```
title3 "^{style[font_face  ='Arial'
                font_size  =7pt
                font_style =italic
                just       =left
                background =white
               ] Excel and PDF versions (with more data ......):
              } ^{style[font_face  ='Arial'
                        font_size  =7pt
                        font_style =italic
                        color      =Crimson
                        url='http://www.cdc.gov/.......htm#001'
                       ] http://www.cdc.gov/........htm#001.
         }" ;
```

CSS & ODS Templates

Cascading Style Sheets are typically used to format HTML documents. This same formatting can be used for all ODS destinations like PDF, HTML5, and Excel. By applying CSS code to an ODS template, the CSS overrides selected attributes of the template.

Saving the CSS code in a central location for all the *Health, United States* table programs to access allows global changes to be made easily. For example, if a decision is made to change a font or color in a selected attribute for all the *Health, United States* trend tables, the change could be made in a global CSS style sheet and all reports run after that would use the modified style. Figure 6 provides an example of CSS formatting style.

```
.HeaderCells{
  Font-Family: Arial, Courier, Helvetica, Helv ;
  Font-Size: 8pt ;
  Font-weight: bold ;
  Font-style: italic ;
  border-top:    none ;
  border-right:  none ;
  border-left:   none ;
  border-bottom: 2px solid black ;
  border-spacing: 0px ;
  border-collapse: collapse;
  Color: #0033AA ;
  BackGround-Color: #B0B0B0 ;
}
```

Figure 6. CSS Code for Header Cells

One method to apply the CSS styles is to import CSS attributes into an ODS PROC TEMPLATE. The CSS attributes will override existing template style attributes, which can then be applied as needed:

```
proc template ;
  define style styles.HUSHTML5CSSStyle ;
    parent=Styles.Statistical ;
      import "&ROOT_FOLDER.\HUS_CSS\HUS_HTML5_StyleSheet.css" ;
  end ;
run ;
```

SAS ODS REPORT WRITING INTERFACE

The complex format of the *Health, United States* trend tables requires coding that cannot be accomplished in a standard SAS Procedure output and would historically require complex DATA steps or PROC REPORT coding. The RWI provides a more elegant method for this type of table generation. The RWI is included as a production version in version 9.4 of Base SAS. Interim SAS updates (now 9.4 maintenance 6) continue to improve the RWI with additional features. The RWI gives full control for report writing. As part of the SAS ODS, users can use RWI to take advantage of various formatting including true proportional fonts, styles, colors, Unicode characters, traffic lighting, and backgrounds. The RWI allows for exact pixel placement of text, images, and custom tables that can be controlled through the DATA step.

For this project the RWI is the start to finish technology used to create the properly formatted trend tables in the various output file types that can include: PDF, HTML5, and Excel. The RWI takes an existing process that includes various steps and technology and reduces it down to one step taking a SAS dataset and outputting properly formatted trend table reports in PDF and HTML5 formats.

Table Creation using DATA _NULL_

DATA _NULL_ is simply a DATA step where there is no output SAS dataset. This is used when outputting text files instead of SAS datasets. DATA _NULL_ for report writing has been used in the past to include printer control characters to produce custom reports of tabular data that would render properly at a physical printer. While the RWI also uses the DATAT _NULL_ DATAT step, the RWI provides a robust object-oriented language to provide flexibility and full control to create tables with formatting controlled by the DATA step. This allows for controls including: conditional logic, formatting capabilities, BY-group processing, arrays, and many more.

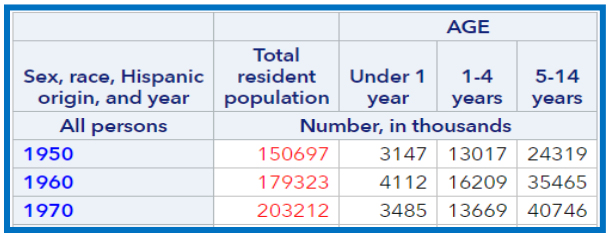
Step 1: To control the output of the data table to the prescribed custom report, the data must first be transposed from the “indicator” style table that the data is stored in, referred to as the Master table, to one that resembles the desired report. Table 4 shows a sample of the formatted Master table being transposed to the table format needed for the custom output shown in Table 5.

YEAR_001	GROUP_NUM_001	SUB_GROUP_NUM_001	COUNT_001	FOOTNOTES_001
1950	All persons	Total Resident Population	150,697	-
1950	All persons	Under 1 year	3,147	-
1950	All persons	1- 4 years	13,017	-
1950	All persons	5-14 years	24,319	-
1950	All persons	15-24 years	22,098	-
1950	All persons	25-34 years	23,759	-
1950	All persons	35-44 years	21,450	-
1950	All persons	45-54 years	17,343	-
1950	All persons	55-64 years	13,370	-
1950	All persons	65-74 years	8,340	-
1950	All persons	75-84 years	3,278	-
1950	All persons	85 years and over	577	-
1950	Male	Total Resident Population	74,833	-
1950	Male	Under 1 year	1,602	-
1950	Male	1- 4 years	6,634	-
1950	Male	5-14 years	12,375	-

Table 4. NEW Master Table

YEAR_001	GROUP_NUM_001	GROUP_POPULATION	AGE_CAT_01	AGE_CAT_02	AGE_CAT_03	AGE_CAT_04
1950	All persons	150697	3147	13017	24319	22098
1960	All persons	179323	4112	16209	35465	24020
1970	All persons	203212	3485	13669	40746	35441
1980	All persons	226546	3534	12815	34942	42487

Table 5. Transposed Table for Report



Sex, race, Hispanic origin, and year	Total resident population	AGE		
		Under 1 year	1-4 years	5-14 years
All persons	Number, in thousands			
1950	150697	3147	13017	24319
1960	179323	4112	16209	35465
1970	203212	3485	13669	40746

Figure 7. Sample of Formatted Table Created with SAS RWI

Step 2: The code below initiates the PDF and HTML5 ODS output destination with a few options with syntax specific to each file type.

```
* PDF FILE * ;
ODS PDF file = "&ROOT_FOLDER.\...\HUS_&YEAR._&TABABR._&SUFFIX..pdf"
        style = styles.HUSPDFCSSStyle
        startpage = ON
        title = "PDF Title: Health U.S. &YEAR. Table &TABABR." ;

* HTML FILE * ;
filename filedir "&ROOT_FOLDER.\...\" ;
ODS HTML5 path = filedir
          file = "HUS_&YEAR._&TABABR._&SUFFIX..html"
          (title = "HTML Title: Health U.S. &YEAR. Table &TABABR.")
          style = styles.HUSHTML5CSSStyle ;
```

Step 3: The following code demonstrates how to take the transposed dataset Table 5 and create a formatted output similar to the *Health, United States* table, “Table 1. Resident Population, by Age, Sex, Race, and Hispanic Origin: United States, Selected Years 1950–2016” (Figure 7). Some of the formatting demonstrated below include: nested column headers, splitting labels, creating accessibility tags, and various style formatting:

```
data _NULL_ ;
  set WORK_DATA end=LAST ;
    by group_num_001 ;
    if (_n_=1) then do ;   /* 1 */
      dcl odsout HUS() ;
      HUS.table_start(name: "EXAMPLE_TABLE_001") ;
        HUS.head_start() ;   /* 2 */
          HUS.row_start() ;
            HUS.format_cell() ;
            HUS.format_cell() ;
            HUS.format_cell(data:"AGE", column_span:3) ;   /* 3 */
          HUS.row_end() ;
          HUS.row_start() ;
            HUS.format_cell(data:"Sex, race, Hispanic|origin, and year",
                            split:"|", vjust:'B') ;   /* 4 */
            HUS.format_cell(data:"Total|resident|population", split:"|") ;
            HUS.format_cell(data:"|Under 1|year"            , split:"|") ;
            HUS.format_cell(data:"|  1-4|years"            , split:"|") ;
            HUS.format_cell(data:"| 5-14|years"            , split:"|") ;
          HUS.row_end() ;
        HUS.head_end() ;     /* 2 */
    end ;                    /* 1 */
```

```
    * PRINT GROUP NAME (Formatted Group Number at top of each GROUP) * ;
    if (first.group_num_001) then do ;   /* 5 */
      HUS.row_start() ;
        HUS.format_cell(data:group_num_001, type:'H',   /* 6 */
                        format:'GROUP_NUM_001F.') ;
        HUS.format_cell(data:"Number, in thousands", type:'H',
                        column_span:4) ;
      HUS.row_end() ;
    end ;                                /* 5 */

    * OUTPUT DATA WITH ROW HEADERS * ;
    HUS.row_start() ;   /* 7 */
      HUS.format_cell(data:put(year_001,4.)||"^{leaders .}",   /* 8 */
                      type:'H',   /* 9 */
                      style_elem:'RowHeader',   /* 10 */
                      inline_attr:'color=blue',   /* 11 */
                      just:'left') ;
      HUS.format_cell(data:group_population,
                      style_attr:'color=red just=right') ;   /* 12 */
      HUS.format_cell(data:age_cat_01, just:'right') ;
      HUS.format_cell(data:age_cat_02, just:'right') ;
      HUS.format_cell(data:age_cat_03, just:'right') ;
    HUS.row_end() ;     /* 7 */

    if (LAST) then do ;   /* 13 */
      HUS.table_end() ;
      HUS.delete() ;
    end ;                 /* 13 */
run ;
```

1. The DATA _NULL_ statement starts a data step where no SAS dataset is being created. Comment /* 1 */ marks an IF-THEN code block of what to do for the first record of the dataset. In this block an ODSOUT object called “HUS” is declared followed by nesting Table, Header, Row, and Cell methods. This is to create the first 2 rows of the output file column headers.
2. The HEAD_START() and HEAD_END() methods (comment /* 2 */) identify these rows as column headers. Identifying the header rows allows the output PDF and HTML5 files to be tagged for accessibility. In these column headers, “AGE” spans 3 columns of age groups below with the COLUMN_SPAN attribute used in the FORMAT_CELL() method (comment /* 3 */). In the second row the labels are too long to fit in the desired width of the columns so the SPLIT:”|” attribute identifies the Pipe character “|” as the character to mark where the labels should be split in the DATA: attribute (comment /* 4 */).
3. Comment /* 5 */ marks what to do for the first record of each “Sex, race, Hispanic origin, and year” group. This is referred to as “BY-Group” processing in SAS. In this example the first group is “All Persons”. Like the previous section this needs to be identified as a header for accessibility. This case demonstrates the TYPE:’H’ attribute of the FORMAT_CELL() method to identify these cells as headers for appropriate tagging (comment /* 6 */).
4. Comment /* 7 */ mark the ROW_START() and ROW_END() methods that surround the nested FORMAT_CELL() methods to process the rest of the rows in the dataset. For each row the YEAR is displayed with “……” following the YEAR values (comment /* 8 */). Comments /* 9 */ and /* 10 */ show how the YEAR cell, for each row, is identified as a row header for accessibility tagging; using both the TYPE:’H’ and STYLE_ELEM:’RowHeader” attributes of the FORMAT_CELL() method. Comments /*

11 */ and /* 12 */ show 2 different ways to control the position and color of the data values in columns 1 and 2.

5. Finally, comment /* 13 */ marks the block of code for what to do at the end of the dataset once all of the data has been processed. Using the TABLE_END() method to close the table and DELETE() method to close out the ODSOUT object called “HUS”.

SECTION 508 ACCESSIBILITY

For tables to be Section 508 compliant for accessibility, metadata must be present for screen reader software to properly present the table to a person with visual impairment. The metadata codes, referred to as “tags,” are hidden, when visually reading, but used by screen reader software to describe the structure and information in a table. To make a table Section 508 compliant, tags must be included to differentiate between row and column headers and data cell values.

When using the RWI to generate tables in this way, the tables are automatically tagged appropriately for 508 compliance based on the row and column headers. This automatic tagging is turned on by using the system option ACCESSIBLETABLE, available in SAS 9.4 maintenance release 6 and makes the output tables Section 508 compliant by default. The ACCESSIBLECHECK option writes messages to the SAS log if common violations of accessibility standards are found such as markup errors that cause screen readers to miss content.

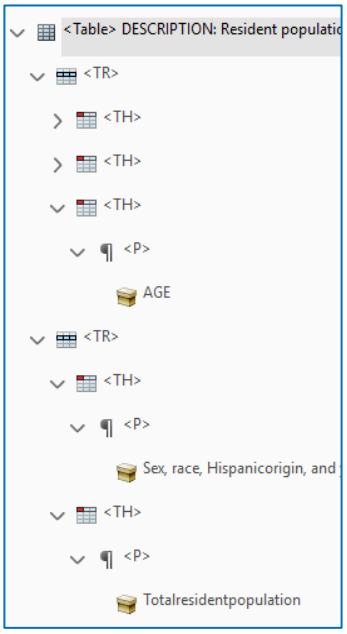


Figure 8. Sample of PDF Table, Row, and Header Tags

Sex, race, Hispanic origin, and year	Total resident population	AGE: Under 1 year	1-4 years	5-14 years	15-24 years	25-34 years	35-44 years
All persons				Number, in thousands			
1950	150,697	3,147	13,017	24,319	22,098	23,759	21,450
1960	179,323	4,112	16,209	35,465	24,020	22,818	24,081
1970	203,212	3,485	13,669	40,746	35,441	24,907	23,088

Figure 9. Sample of NEW tagged PDF trend table

Figure 8 demonstrates the way that metadata tags in PDF files, generated automatically using the RWI, can be viewed. In this example, Adobe Acrobat Professional is used but any software capable of properly listing and modifying tags can display this. Figure 9 shows the printed output table where these tags are embedded and not visible to the reader. To make a table read properly by a screen reader, all the row and column headers must be tagged as headers.

In the case of complex tables with nested row and column headers, screen readers must be capable of identifying the correct headers for each of the data cells. In Figure 8, the top left second data value: 3,147 would be noted as the count "Number, in thousands" of "Sex, race, Hispanic origin: All Persons" in "1950" "Under the Age of 1".

Figure 10 shows the tags that are automatically generated when using the RWI to output a properly designed table in a HTML5 file. To view the 508 tagging click "Show source" in the software being used to view the HTML5 file.

```
<table class="table" style="border-spacing: 0" aria-label="DESCRIPTION: Resident population, by age, sex, race, and Hispani
<caption class="accessiblecaption" aria-label="CAPTION: Resident population, by age, sex, race, and Hispanic origin for dec
population, by age, sex, race, and Hispanic origin for decenial and recent years 1950 to 2015</caption>
<thead>
<tr>
<td class="c datacells" style="border-spacing: 1px; width: 25mm"> </td>
<td class="c datacells" style="border-spacing: 1px; width: 22mm"> </td>
<th class="c headercells" style="border-spacing: 0" colspan="11" scope="colgroup">AGE</th>
</tr>
<tr>
<th class="c headercells" style="border-spacing: 0; width: 25mm" scope="col">Sex, race, Hispanic<br/>origin, and year</th>
<th class="r headercells" style="border-spacing: 0; width: 22mm" scope="col">Total<br/>resident<br/>population</th>
<th class="r headercells" style="border-spacing: 0; width: 13mm" scope="col"><br/>Under 1<br/>year</th>
<th class="r headercells" style="border-spacing: 0; width: 13mm" scope="col"><br/>1-4<br/>years</th>
<th class="r headercells" style="border-spacing: 0; width: 13mm" scope="col"><br/>5-14<br/>years</th>
```

Figure 10. Sample HTML5 Table, Row, and Header Tags

HEALTH, UNITED STATES NEW TREND TABLE PDF

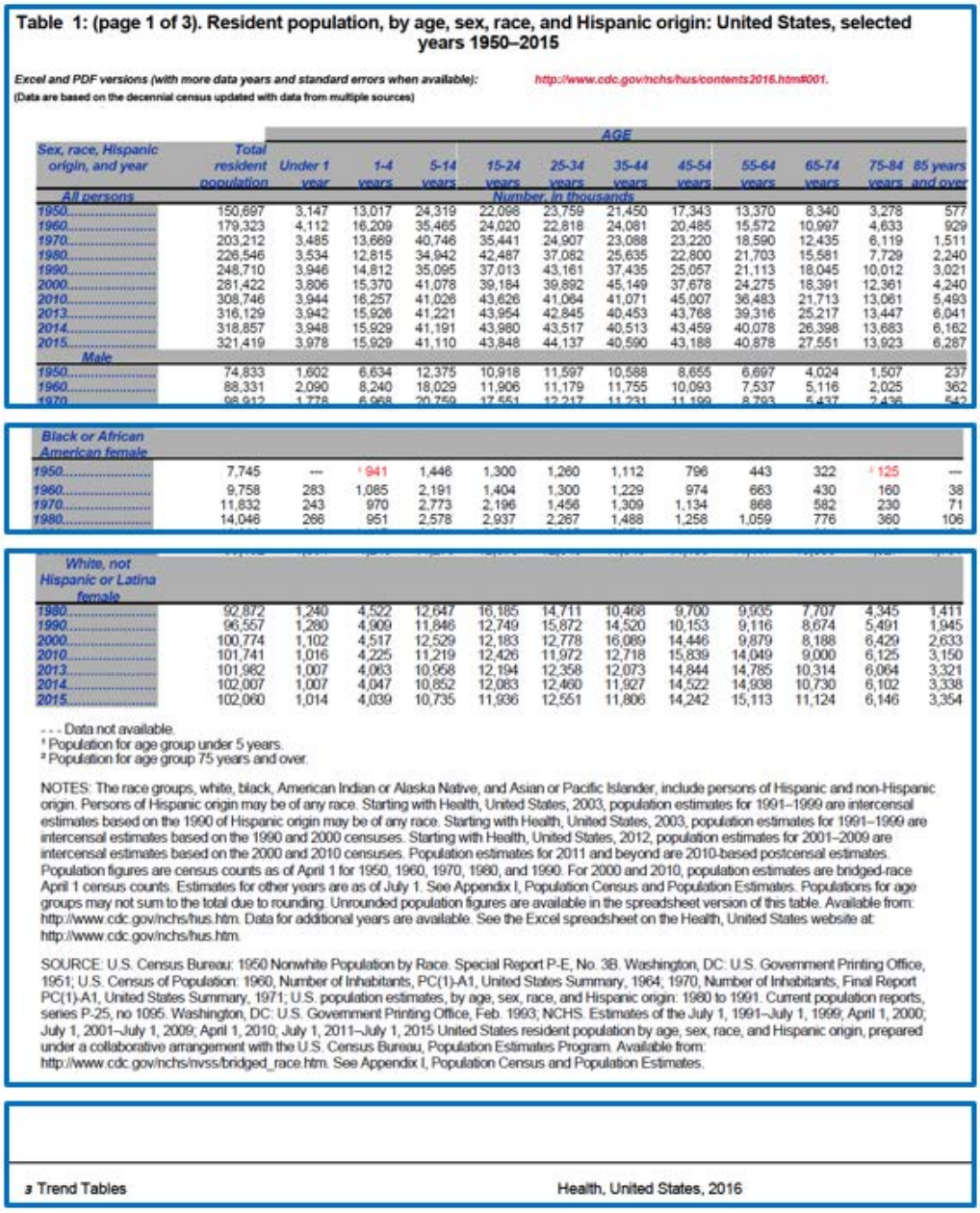


Table 1: (page 1 of 3). Resident population, by age, sex, race, and Hispanic origin: United States, selected years 1950–2015

Excel and PDF versions (with more data years and standard errors when available): http://www.cdc.gov/nchs/hus/contents2016.htm#001.

(Data are based on the decennial census updated with data from multiple sources)

Sex, race, Hispanic origin, and year	Total resident population	AGE: Under 1 year	1–4 years	5–14 years	15–24 years	25–34 years	35–44 years	45–54 years	55–64 years	65–74 years	75–84 years	85 years and over
					Number, in thousands							
All persons												
1950	150,697	3,147	13,017	24,319	22,098	23,759	21,450	17,343	13,370	8,340	3,278	577
1960	179,323	4,112	16,209	35,465	24,020	22,818	24,081	20,485	15,572	10,997	4,633	929
1970	203,212	3,485	13,669	40,746	35,441	24,907	23,088	23,220	18,590	12,435	6,119	1,511
1980	226,546	3,534	12,815	34,942	42,487	37,082	25,635	22,800	21,703	15,581	7,729	2,240
1990	248,710	3,946	14,812	35,095	37,013	43,161	37,435	25,057	21,113	18,045	10,012	3,021
2000	281,422	3,806	15,370	41,078	39,184	39,892	45,149	37,678	24,275	18,391	12,361	4,240
2010	308,746	3,944	16,257	41,028	43,626	41,064	41,071	45,007	38,483	21,713	13,061	5,493
2013	316,129	3,942	15,926	41,221	43,954	42,845	40,453	43,768	39,316	25,217	13,447	6,041
2014	318,857	3,948	15,929	41,191	43,980	43,517	40,513	43,459	40,078	26,398	13,683	6,162
2015	321,419	3,978	15,929	41,110	43,848	44,137	40,590	43,188	40,878	27,551	13,923	6,287
Male												
1950	74,833	1,602	6,634	12,375	10,918	11,597	10,588	8,655	6,697	4,024	1,507	237
1960	88,331	2,090	8,240	18,029	11,906	11,179	11,755	10,093	7,537	5,116	2,025	362
1970	98,912	1,778	6,968	20,759	17,551	12,217	11,231	11,199	8,793	5,437	2,436	542
Black or African American female												
1950	7,745	---	[1] 941	1,446	1,300	1,260	1,112	796	443	322	[2] 125	---
1960	9,758	283	1,085	2,191	1,404	1,300	1,229	974	663	430	160	38
1970	11,832	243	970	2,773	2,196	1,456	1,309	1,134	868	582	230	71
1980	14,046	266	951	2,578	2,937	2,267	1,488	1,258	1,059	776	360	106
White, not Hispanic or Latina female												
1980	92,872	1,240	4,522	12,647	16,185	14,711	10,468	9,700	9,935	7,707	4,345	1,411
1990	96,557	1,280	4,909	11,846	12,749	15,872	14,520	10,153	9,116	8,674	5,491	1,945
2000	100,774	1,102	4,517	12,529	12,183	12,778	16,089	14,446	9,879	8,188	6,429	2,633
2010	101,741	1,016	4,225	11,219	12,426	11,972	12,718	15,839	14,049	9,000	6,125	3,150
2013	101,982	1,007	4,063	10,958	12,194	12,358	12,073	14,844	14,785	10,314	6,064	3,321
2014	102,007	1,007	4,047	10,852	12,083	12,460	11,927	14,522	14,938	10,730	6,102	3,338
2015	102,060	1,014	4,039	10,735	11,936	12,551	11,806	14,242	15,113	11,124	6,146	3,354

--- Data not available.
[1] Population for age group under 5 years.
[2] Population for age group 75 years and over.

NOTES: The race groups, white, black, American Indian or Alaska Native, and Asian or Pacific Islander, include persons of Hispanic and non-Hispanic origin. Persons of Hispanic origin may be of any race. Starting with Health, United States, 2003, population estimates for 1991–1999 are intercensal estimates based on the 1990 of Hispanic origin may be of any race. Starting with Health, United States, 2003, population estimates for 1991–1999 are intercensal estimates based on the 1990 and 2000 censuses. Starting with Health, United States, 2012, population estimates for 2001–2009 are intercensal estimates based on the 2000 and 2010 censuses. Population estimates for 2011 and beyond are 2010-based postcensal estimates. Population figures are census counts as of April 1 for 1950, 1960, 1970, 1980, and 1990. For 2000 and 2010, population estimates are bridged-race April 1 census counts. Estimates for other years are as of July 1. See Appendix I, Population Census and Population Estimates. Populations for age groups may not sum to the total due to rounding. Unrounded population figures are available in the spreadsheet version of this table. Available from: http://www.cdc.gov/nchs/hus.htm. Data for additional years are available. See the Excel spreadsheet on the Health, United States website at: http://www.cdc.gov/nchs/hus.htm.

SOURCE: U.S. Census Bureau: 1950 Nonwhite Population by Race. Special Report P-E, No. 3B. Washington, DC: U.S. Government Printing Office, 1951; U.S. Census of Population: 1960, Number of Inhabitants, PC(1)-A1, United States Summary, 1964; 1970, Number of Inhabitants, Final Report PC(1)-A1, United States Summary, 1971; U.S. population estimates, by age, sex, race, and Hispanic origin: 1980 to 1991. Current population reports, series P-25, no 1095. Washington, DC: U.S. Government Printing Office, Feb. 1993; NCHS. Estimates of the July 1, 1991–July 1, 1999; April 1, 2000; July 1, 2001–July 1, 2009; April 1, 2010; July 1, 2011–July 1, 2015 United States resident population by age, sex, race, and Hispanic origin, prepared under a collaborative arrangement with the U.S. Census Bureau, Population Estimates Program. Available from: http://www.cdc.gov/nchs/nvss/bridged_race.htm. See Appendix I, Population Census and Population Estimates.

Figure 11. Sample of New PDF (Sections of Table 1)

The final product can be seen in Figure 11, Table 1 PDF version of *Health, United States.* This table illustrates a file generated directly from SAS that includes:

- The same table structure as the original PDF
- Some color and style to demonstrate possibilities
- Section 508-tagging metadata automated through SAS code (as shown in Figure 8)

HEALTH, UNITED STATES NEW TREND TABLES HTML5

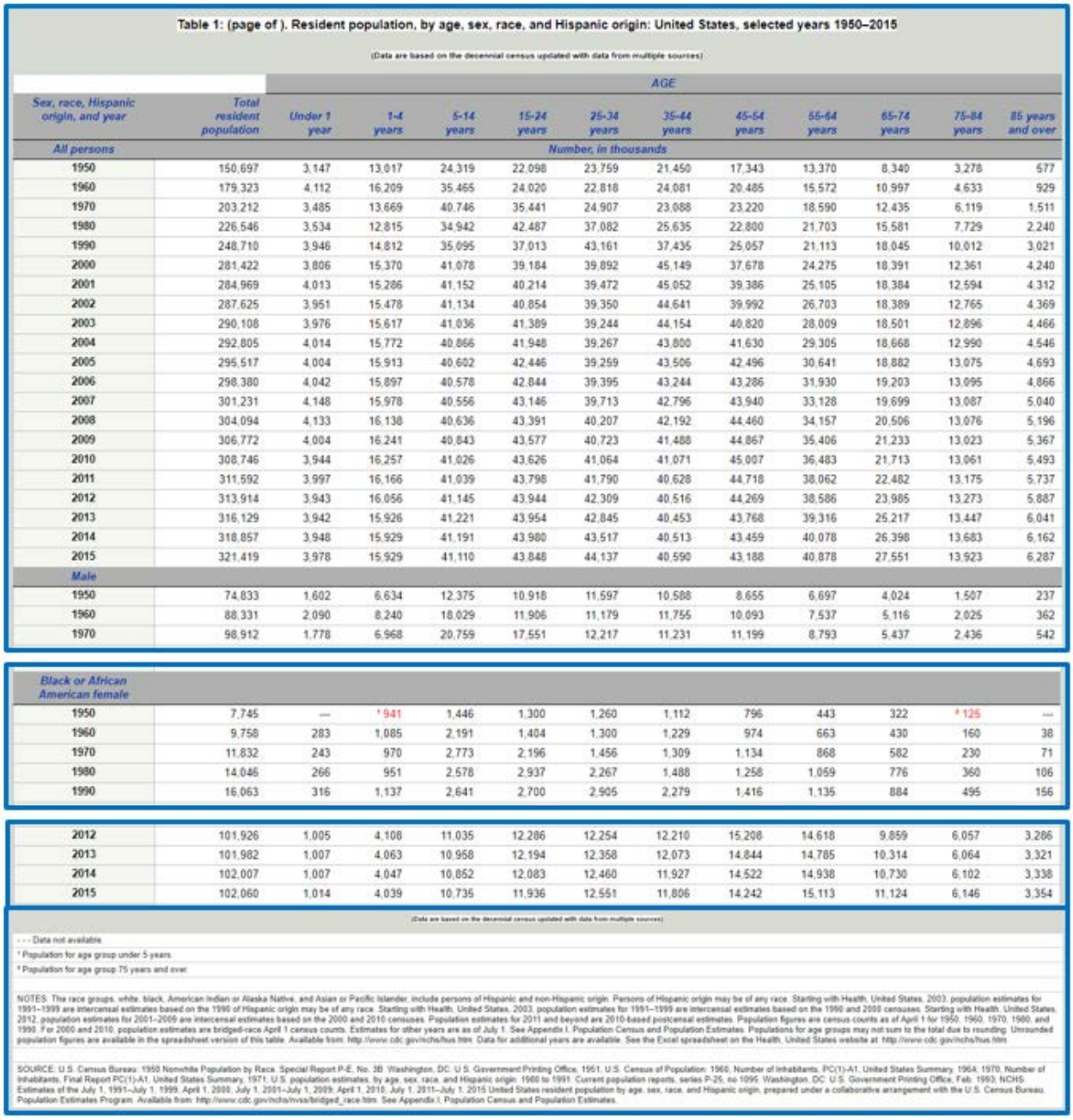


Table 1: (page of). Resident population, by age, sex, race, and Hispanic origin: United States, selected years 1950–2015

(Data are based on the decennial census updated with data from multiple sources)

Sex, race, Hispanic origin, and year	Total resident population	AGE										
		Under 1 year	1–4 years	5–14 years	15–24 years	25–34 years	35–44 years	45–54 years	55–64 years	65–74 years	75–84 years	85 years and over
All persons	Number, in thousands											
1950	150,697	3,147	13,017	24,319	22,098	23,759	21,450	17,343	13,370	8,340	3,278	577
1960	179,323	4,112	16,209	35,465	24,020	22,818	24,081	20,485	15,572	10,997	4,633	929
1970	203,212	3,485	13,669	40,746	35,441	24,907	23,088	23,220	18,590	12,435	6,119	1,511
1980	226,546	3,534	12,815	34,942	42,487	37,082	25,635	22,800	21,703	15,581	7,729	2,240
1990	248,710	3,946	14,812	35,095	37,013	43,161	37,435	25,057	21,113	18,045	10,012	3,021
2000	281,422	3,806	15,370	41,078	39,184	39,892	45,149	37,678	24,275	18,391	12,361	4,240
2001	284,969	4,013	15,286	41,152	40,214	39,472	45,052	39,386	25,105	18,384	12,594	4,312
2002	287,625	3,951	15,478	41,134	40,854	39,350	44,641	39,992	26,703	18,389	12,765	4,369
2003	290,108	3,976	15,617	41,036	41,389	39,244	44,154	40,820	28,009	18,501	12,896	4,466
2004	292,805	4,014	15,772	40,866	41,948	39,267	43,800	41,630	29,305	18,668	12,990	4,546
2005	295,517	4,004	15,913	40,602	42,446	39,259	43,506	42,496	30,641	18,882	13,075	4,693
2006	298,380	4,042	15,897	40,578	42,844	39,395	43,244	43,286	31,930	19,203	13,095	4,866
2007	301,231	4,148	15,978	40,556	43,146	39,713	42,796	43,940	33,128	19,699	13,087	5,040
2008	304,094	4,133	16,138	40,636	43,391	40,207	42,192	44,460	34,157	20,506	13,076	5,196
2009	306,772	4,004	16,241	40,843	43,577	40,723	41,488	44,867	35,406	21,233	13,023	5,367
2010	308,746	3,944	16,257	41,026	43,626	41,064	41,071	45,007	36,483	21,713	13,061	5,493
2011	311,592	3,997	16,166	41,039	43,798	41,790	40,628	44,718	38,062	22,482	13,175	5,737
2012	313,914	3,943	16,056	41,145	43,944	42,309	40,516	44,269	38,586	23,985	13,273	5,887
2013	316,129	3,942	15,926	41,221	43,954	42,845	40,453	43,768	39,316	25,217	13,447	6,041
2014	318,857	3,948	15,929	41,191	43,980	43,517	40,513	43,459	40,078	26,398	13,683	6,162
2015	321,419	3,978	15,929	41,110	43,848	44,137	40,590	43,188	40,878	27,551	13,923	6,287
Male												
1950	74,833	1,602	6,634	12,375	10,918	11,597	10,588	8,655	6,697	4,024	1,507	237
1960	88,331	2,090	8,240	18,029	11,906	11,179	11,755	10,093	7,537	5,116	2,025	362
1970	98,912	1,778	6,968	20,759	17,551	12,217	11,231	11,199	8,793	5,437	2,436	542
Black or African American female												
1950	7,745	---	* 941	1,446	1,300	1,260	1,112	796	443	322	* 125	---
1960	9,758	283	1,085	2,191	1,404	1,300	1,229	974	663	430	160	38
1970	11,832	243	970	2,773	2,196	1,456	1,309	1,134	868	582	230	71
1980	14,046	266	951	2,578	2,937	2,267	1,488	1,258	1,059	776	360	106
1990	16,063	316	1,137	2,641	2,700	2,905	2,279	1,416	1,135	884	495	156
2012	101,926	1,005	4,108	11,035	12,286	12,254	12,210	15,208	14,618	9,859	6,057	3,286
2013	101,982	1,007	4,063	10,958	12,194	12,358	12,073	14,844	14,785	10,314	6,064	3,321
2014	102,007	1,007	4,047	10,852	12,083	12,460	11,927	14,522	14,938	10,730	6,102	3,338
2015	102,060	1,014	4,039	10,735	11,936	12,551	11,806	14,242	15,113	11,124	6,146	3,354

(Data are based on the decennial census updated with data from multiple sources)

--- Data not available.

* Population for age group under 5 years.

* Population for age group 75 years and over.

NOTES: The race groups, white, black, American Indian or Alaska Native, and Asian or Pacific Islander, include persons of Hispanic and non-Hispanic origin. Persons of Hispanic origin may be of any race. Starting with Health, United States, 2003, population estimates for 1991–1999 are intercensal estimates based on the 1990 of Hispanic origin may be of any race. Starting with Health, United States, 2003, population estimates for 1991–1999 are intercensal estimates based on the 1990 and 2000 censuses. Starting with Health, United States, 2012, population estimates for 2001–2009 are intercensal estimates based on the 2000 and 2010 censuses. Population estimates for 2011 and beyond are 2010-based postcensal estimates. Population figures are census counts as of April 1 for 1950, 1960, 1970, 1980, and 1990. For 2000 and 2010, population estimates are bridged-race April 1 census counts. Estimates for other years are as of July 1. See Appendix I, Population Census and Population Estimates. Populations for age groups may not sum to the total due to rounding. Unrounded population figures are available in the spreadsheet version of this table. Available from: http://www.cdc.gov/nchs/hus.htm. Data for additional years are available. See the Excel spreadsheet on the Health, United States website at: http://www.cdc.gov/nchs/hus.htm

SOURCE: U.S. Census Bureau. 1950 Nonwhite Population by Race. Special Report P-E, No. 3B. Washington, DC: U.S. Government Printing Office, 1951. U.S. Census of Population: 1960, Number of Inhabitants, PC(1)-A1, United States Summary. 1964. 1970, Number of Inhabitants, Final Report PC(1)-A1, United States Summary, 1971. U.S. population estimates, by age, sex, race, and Hispanic origin: 1980 to 1991. Current population reports, series P-25, no 1095. Washington, DC: U.S. Government Printing Office, Feb. 1993; NCHS. Estimates of the July 1, 1991–July 1, 1999, April 1, 2000, July 1, 2001–July 1, 2009, April 1, 2010, July 1, 2011–July 1, 2015 United States resident population by age, sex, race, and Hispanic origin, prepared under a collaborative arrangement with the U.S. Census Bureau. Population Estimates Program. Available from: http://www.cdc.gov/nchs/nvss/bridged_race.htm. See Appendix I, Population Census and Population Estimates.

Figure 12. Sample of New HTML5 (Sections of Table 1)

As seen in Figure 12, the Excel version of Table 1 is a file generated directly from SAS that includes:

- The same table structure as the PDF
- Some color and style to demonstrate possibilities
- Section 508-tagging metadata produced with SAS code (as shown in Figure 10)

CONCLUSION

This case study illustrates how using the SAS ODS and RWI could automate much of the Health*, United States* production process. Section 508 accessibility features, some of which are new in SAS 9.4 maintenance release 6, create more efficient Section 508-compliant tables.

Summary of new outputs:

- PDF reports with custom formatting, intended for printing, can be generated to match the existing PDF output, thus maintaining consistency going forward while improving the accessibility of the files
- HTML5 version of these reports can replace the existing Excel files, intended for screen reading, with a format that is better suited for online publishing.
- CSV file would be produced to provide an open format file with the data in a plain text format for more direct access to the data for various analytic uses.

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