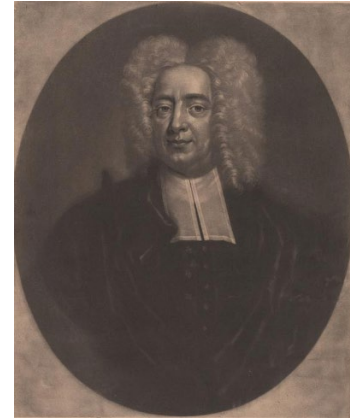


Sanitation and Statistics: How Public Health Professionals Revolutionized the U.S. Census

On March 11, 2020, the Census Bureau issued a statement that said the agency was “carefully monitoring the coronavirus (COVID-19) situation... We have also established the Census Bureau COVID-19 Internal Task Force to continuously monitor the situation.”¹ In the following months, the Census Bureau adopted its 2020 Census decennial operations to meet the challenges associated with conducting a decennial census during a historic public health emergency. As the Covid-19 pandemic continues to unfold, perhaps, the U.S. government can draw upon the lessons of the 19th Century federal statisticians, who revolutionized how the U.S. government collected and organized the vital statistics² related to the lives and health of the nation’s expanding population.



Above: As one of the most influential 17th preachers and authors in the Massachusetts Bay Colony, Cotton Mather used vital statistics to promote inoculation as a means of preventing smallpox and reducing the danger posed by epidemics.
Courtesy of the Smithsonian National Portrait Gallery.

Before “the great sanitary awakening” of the mid-19th century, the history of vital statistics in the United States and the development of a national public health system ran parallel to each other but rarely intersected. As early as the mid-late 1600s, colonial governments in places such as Virginia, Massachusetts, and Connecticut, used vital records as a tool for officials with administering the law and protecting the rights of individuals.³ Recognizing the administrative advantages of collecting population data, the Founding Fathers empowered Congress to carry out a national decennial census in “such a manner as they shall by Law direct.”⁴ By conducting a decennial census, the Founding Fathers established a method for accurately recording the nation’s population and distributing political power among the states.⁵ Yet, the nation’s founders failed to fully recognize the vital role census data, or a national registration system could play in improving the nation’s health.⁶

The enormous task of improving America’s infant public health system using vital statistics fell to 19th Century reformers, like Lemuel Shattuck, and medical professionals, like John Shaw Billings. Although these two individuals primarily focused on vital statistics and public health, their respective contributions to 1850, 1880, and 1890 U.S. Censuses, led to a series of methodological and technological improvements that remain pertinent to the modern Census Bureau.

Lemuel Shattuck and the 1850 Census

Born in Ashby, Massachusetts, on October 15, 1793, Lemuel Shattuck embarked upon a diverse career that spanned a little more than four decades and culminated in him pioneering the collection and use of

vital statistics for the United States' government's budding interest in public health.⁷ After retiring from his career as a bookseller and publisher at the age of 46, Shattuck devoted the remainder of his professional career to public service. By the time Shattuck embarked upon his public service career, many of the twenty-six states had laws requiring a state official or clergy member to record births, marriages, and deaths in the community.⁸ However, most state governments struggled to enforce these local laws and only Massachusetts (1841), New York (1847), New Jersey (1848), and New Hampshire (1849) had "modern" registration laws before the 1850 Census.⁹

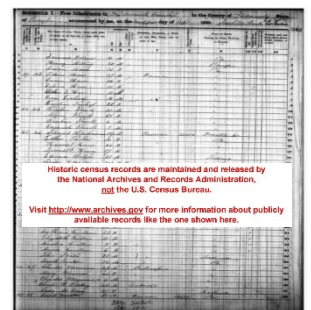
Having been active in Massachusetts politics and played an important role in helping to pass the 1842 and 1844 revisions to the 1841 registration law, Shattuck developed an appreciation for the utility of vital statistics and dedicated the remainder of his life to establishing a modern public health system that mirrored those emerging in Europe.¹⁰



Lemuel Shattuck (1793-1859).
Courtesy of the Library of Congress.

By the time Joseph C.G. Kennedy, the Superintendent of the 1850 Census, invited Shattuck and two of his colleagues to serve as consultants in the planning of the 1850 Census, Shattuck had helped found the American Statistical Association (1839); championed numerous pieces of legislation related to the creation a Massachusetts's statewide vital registration system; overseen the City of Boston's 1845 Census; and begun research for his famous "Plan for a Sanitary Survey of Massachusetts", a document that provided a template for America's modern public health system.¹¹ Given the breadth of Shattuck's previous experiences, Kennedy hoped Shattuck and his colleagues would produce a national census that eliminated the faults and some of the controversy that had resulted from the 1840 Census's data.¹²

According to J.D.B. DeBow, Kennedy's successor as the Superintendent of the Census, Shattuck exceeded expectations and almost single-handedly improved how the U.S. government conducted censuses.¹³ For example, DeBow wrote, "*The feature of recording the name of every person enumerated, was proposed by this gentleman, and was first adopted in the Boston census of 1845...*"¹⁴ Prior to this, the U.S. marshals only recorded the names of the head of household. By using the individual as the primary census unit instead of the household, the marshals and their assistants collected more information about each person. With more accurate and better-organized data, the census clerks, leaders, and external statisticians produced more informative reports and tables about the United States' population, economic activities, social problems, and efforts in the field of public health.¹⁵



Above: The assistant marshal enumerated President James Buchanan using the schedule designed by Shattuck for the 1850 Census.
Courtesy of the National Archives

NUMBER OF INQUIRIES OR DETAILS RELATING TO MORTALITY: 1850 TO 1890.

Items of Inquiry.	1850.	1860.	1870.	1880.	1890.
Name of person deceased.....	1	1	1	1	1
Color:					
White, black, or mulatto.....	1	1	1	1	1
White, black, mulatto, Chinese, or Indian.....	1	1	1	1	1
White, black, or mixed blood; also whether Chinese, Japanese, or Indian.....	1	1	1	1	1
Sex.....	1	1	1	1	1
Age:					
Exact or estimated; if under 1 year, in months.....	1	1	1	1	1
At last birthday; if under 1 year, in months.....	1	1	1	1	1
Years, months, and days.....	1	1	1	1	1
Free or slave.....	1	1	1	1	1
Marital condition:					
Single, married, widowed, or divorced.....	1	1	1	1	1
Place of birth (State, Territory, or country).....	1	1	1	1	1
Parentage:					
Father of foreign birth; mother of foreign birth.....	1	1	2	2	2
Place of birth of father; place of birth of mother.....	1	1	1	2	2
Profession, occupation, or trade.....	1	1	1	1	1
Month of birth, if born in census year.....	1	1	1	1	1
Month in which the person died.....	1	1	1	1	1
Disease or cause of death.....	1	1	1	1	1
Number of days ill.....	1	1	1	1	1
Length of time a resident of country.....	1	1	1	1	1
Name of place where disease was contracted, if other than place of death.....	1	1	1	1	1
Name of attending physician.....	1	1	1	1	1
Whether inmate or draftee.....	1	1	1	1	1
Soldier, sailor, or marine (United States or Confederate) in civil war, or widow of such person.....	1	1	1	1	1
Total.....	11	11	11	14	17

a Not including inquiry as to "Number of family," for purposes of identification.
 b Not including inquiry as to "Number of ward or sanitary district."

Wright included the above table in one of his congressional reports to highlight the additional inquiries added to the mortality tables between 1850 and 1890.

Courtesy of the U.S. Census Bureau

In addition to changing the primary census unit, Shattuck also introduced the practice of writing an explanatory introduction at the beginning of each census report and of providing enumerators with instructions and specialized census schedules for collecting vital statistics. By implementing these changes, Shattuck recognized the importance of contextualizing and organizing vital statistics and other census data in such a way as to be useful for policymakers. Yet, J.E.D. DeBow later admitted, *“The tables of the census which undertake to give the total number of Births, Marriages, and Deaths, in the year preceding the first of June, 1850, can be said to have but very little value. Nothing short of a registration system in the States can give the required data*

satisfactorily...”¹⁶ DeBow’s statement about the 1850 Census suggested that despite the Shattuck’s help in improving the decennial census, the national government continued to struggle to develop its vital statistics infrastructure a larger public health apparatus.¹⁷ Ultimately, despite DeBow’s misgivings with the 1850 Census, Shattuck’s improvements to the 1850 Census provided a solid foundation for Census Office employees and special agents to the Office’s efforts to accurately collect and analyze America’s vital statistics. Describing the Census Office’s methodology for collecting vital statistics during the 1860 and 1870 censuses, Carroll D. Wright, the Commissioner of Labor,¹⁸ wrote, *“The detail required at the succeeding censuses was not greatly changed, but one or two features were added and the numbers of inquiries slightly increased...”*¹⁹ Thus, Wright acknowledged that the Census Office relied on Shattuck’s census methodology in two decennial censuses following his death in 1859.

Dr. John Shaw Billings Makes Vital Improvements to the Census Office

In 1880, Dr. John Shaw Billings, a U.S. Army surgeon, and Civil War veteran, utilized his nineteen years of medical and federal government experience to expand the national Census Office’s role in collecting, processing, and analyzing the nation’s vital statistics. While Billings had a small role in the 1870 Census, he had a more significant impact Census Office as a special agent for the 1880 and 1890 Censuses.²⁰ For example, during the 1880 Census, Billings encouraged the Census Office to collect mortality data by having physicians complete and return *“a small register of death...”* for each patient who died under their care.²¹ Once the Census Office collected these forms, a skilled physician examined the returns and determined the medical terms used in the final report.²² By collecting data using this administrative procedure, Billings agreed with Dr. Edward Jarvis, the third president of the American Statistical

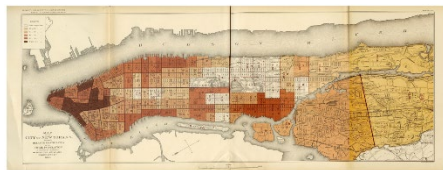
Association and a consultant for the 1850, 1860, and 1870 Censuses, who suggested physicians would have an easier time collecting, interpreting, and analyzing mortality data compared to inexperienced enumerators and census respondents.²³

Having implemented methodological improvements to the 1880 Census and overseen the completion of the vital statistics portion of the 1880 Census, the Census Superintendent, Robert P. Porter, made Billings the special agent for the 1890 Census's vital statistics. In his revised role, Billings made two important contributions to America's emerging public health system.

First, Billings and Census officials worked with local health officials and law enforcement to create small and permanent geographic entities called "sanitary districts." These "sanitary districts" allowed Census Office clerks to analyze and compare the effect of population, topography, and housing on the mortality rate of the inhabitants of large cities, such as New York, Philadelphia, Brooklyn, Boston, Baltimore, and Washington D.C.,²⁴ at a micro-level without having the

data skewed by the fluidity of political boundaries.²⁵ With this granular-level data, Billings and the Census Office produced colorful and detailed maps, which public health officials, sociologists, and health reformers utilized as they sought to help immigrant populations assimilate into their adopted communities.

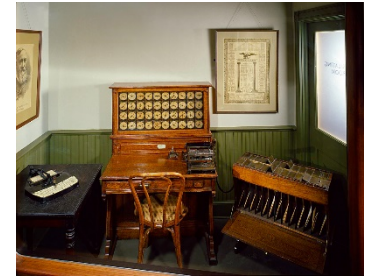
Additionally, public health officials used these more detailed maps to help them prevent or halt the epidemics that continued to affect the population of these urban centers. Finally, the creation of sanitary districts served as an early example of federal and local governments cooperating to design a set of small geographic units based on population and housing characteristics. Having established a precedent of cooperating to produce more accurate tools for collecting and analyzing data sets, the federal officials continued to work with local researchers as they developed what eventually became the modern census-tract.²⁶



Above: A map of Billings's Sanitary Districts in New York City. c. 1894.

Courtesy of the U.S. Census Bureau

Billings also sought a way to process the raw 1890 Census data using technology quickly and accurately. Fortunately, in 1888, Herman Hollerith, a former Census Office statistician and Billings' protégée, invented a mechanical tabulator and devised a revolutionary punch-card system, which the Census Office used to compile the 1890 census data. Billings recognized the importance of the machine in his 1890 final report, writing, "*All these mechanical methods of compiling and computing will be more important in a permanent census bureau which is badly needed in this country...*".²⁷



Above: Hollerith's tabulating system consisted of three different components, a card puncher, the tabulator, and a sorting box. Courtesy of Smithsonian's National Museum of American History.

By the time Carroll D. Wright transmitted Part I of Billings' final report to Congress, Billings had accepted the directorship of the recently established New York Public Library. For the remaining 17 years of his life, Billings dedicated much of his time to expanding the reach and collections of the New York Public Library.



Portrait of Colonel John Shaw Billings, M.D., by Cecilia Beaux (1895).
Courtesy of the U.S. National Library of Medicine.

Conclusion

For over fifty more years, the Census Bureau served as the primary federal agency responsible for collecting the nation's vital statistics and working with external stakeholders to interpret the data. In 1946, President Harry Truman officially transferred "the functions of the...Bureau of the Census...with respect to vital statistics...to the Federal Security Administrator and shall be performed under his direction and control by the United States Public Health Service."²⁸ While this signaled an end of the Census Bureau's direct involvement with managing the nation's vital statistics on a massive scale, Shattuck's and Billings' legacy of revolutionizing data collection and processing remains as pertinent today as it did in the 19th century.

Notes

¹ United States Census Bureau, "Census Bureau Statement on Coronavirus and the 2020 Census." U.S. Census Bureau. press release, March 11, 2020, on [census.gov](https://www.census.gov), accessed November 4, 2020, <https://www.census.gov/newsroom/press-releases/2020/statement-coronavirus.html>.

² Throughout this article, the "vital statistics" are statistics relating to births, deaths, marriages, health, and disease. The term "vital records" describe records of life events kept under governmental authority, including birth certificates, marriage licenses (or marriage certificates), and death certificates.

³ Alice M. Hetzel, National Association for Public Health Statistics and Information Systems, "History and Organization of the Vital Statistics System: Historical Development," in [U.S. Vital Statistics System: Major Activities and Developments, 1950-95, U.S. Department of Health and Human Services](#), February 1997, (Hyattsville, MD: 1997), DHHS Publication No. (PHS) 97-1003, pg. 44.

⁴ U.S. Const. art. I, cl. II.

⁵ For the 1790 Census, U.S. marshals and their assistant marshals listed the name of each head of household, and asked the following questions: (1) The number of free White males (1a) under 16 years and (1b) 16 years and upward; (2) number of free White females; (3) number of other free persons; and (4) number of slaves. "An Act providing for the enumeration of the Inhabitants," in *Annals of Congress*, 1st Cong., 2nd sess., March 1, 1879, Ch. 2, pg. 101.

⁶ Alice M. Hetzel, National Association for Public Health Statistics and Information Systems, "History and Organization of the Vital Statistics System: Historical Development," in [U.S. Vital Statistics System: Major Activities and Developments](#), pg. 44.

⁷ Alice M. Hetzel, National Association for Public Health Statistics and Information Systems, "History and Organization of the Vital Statistics System: Historical Development," in [U.S. Vital Statistics System: Major Activities and Developments](#), pgs. 47-48; "Shattuck, Lemuel," in [Dictionary of American Biography](#), ed. Dumas Malone (New York, NY: 1935), vol. 17, pgs. 33-34; and "Lemuel Shattuck Papers, 1829-1855, Vault A45, Shattuck Unit," *Concord Library*, last modified March 14, 2012, accessed September 1, 2020, https://concordlibrary.org/special-collections/fin_aids/shattuck.

⁸ In 1632, the Grand Assembly of Virginia passed a law requiring a minister or warden from every parish to appear annually at court on June 1st. Upon their arrival, the minister or warden presented a register of christenings, marriages, and burials for the year. To learn more about this topic and decentralized development of the U.S.'s Vital Statics System, see Alice M. Hetzel, National Association for Public Health Statistics and Information Systems, "History and Organization of the Vital Statistics System: Historical Development," in *U.S. Vital Statistics System: Major Activities and Developments, 1950-95*, pgs. 44-49 & 58.

⁹ S. Shapiro, "Development of Birth Registration and Birth Statistics in the United States," *Population Studies*, 4, no 1 (June 1950), pg. 87 & Amasa Walker, Secretary of the Commonwealth, *Ninth Report to the Legislature of Massachusetts, Relating to the Registry and Returns of Births, Marriages and Deaths, in the Commonwealth, for the Year Ending December 31, 1850*, (Boston, MA., Dutton & Wentworth, State Printers, 1851), pg. 73.

¹⁰ "[Lemuel Shattuck \(1793-1859\): Prophet of American Public Health](#)", *American Journal of Public and Nation's Health*, 49, no. 5 (May 1959), pgs. 676-677.

¹¹ "[Lemuel Shattuck \(1793-1859\): Prophet of American Public Health](#)", pgs. 676-677.

¹² To learn more about the controversy surrounding the results of the 1840 Census, see Dr. Edward Jarvis, *Insanity Among the Colored Population of the Free States* (Philadelphia, PA, T.K. & P.G., Printers, 1844) & "Chapter 23: The Politics of Census," in *Hen's Teeth and Horse's Toes*, by Stephen Jay Gold (New York, NY: 1983), pgs. 303-309.

¹³ J.D.B. DeBow, U.S. Census Bureau, [Statistical View of the United States...Compendium of the Seventh Census](#), (Washington, D.C.: A.O.P. Nicholson, Public Printer, 1854), pgs. 12-13.

¹⁴ J.D.B. DeBow, U.S. Census Bureau, [Statistical View of the United States...Compendium of the Seventh Census](#), pg. 13.

¹⁵ Alice M. Hetzel, National Association for Public Health Statistics and Information Systems, "History and Organization of the Vital Statistics System: Historical Development," in *U.S. Vital Statistics System: Major Activities and Developments, 1950-95*, pg. 48 & Frank H. Godley, National Center for Health Statistics, "Lemuel Shattuck:

American Pioneer in Population,” in [Proceedings of Social Statistics Section, Los Angeles](#), 1966, pgs. 474-476. Los Angeles: American Statistical Association.

¹⁶ J.D.B. DeBow, U.S. Census Bureau, [Statistical View of the United States...Compendium of the Seventh Census](#), pg. 57.

¹⁷ Gerald N. Grob, "[Edward Jarvis and the Federal Census: A Chapter in the History of Nineteenth-Century American Medicine](#)," *Bulletin of the History of Medicine*, vol. 50, no. 1 (Spring, 1976), pgs. 14-15; J.D.B. DeBow, U.S. Census Bureau, [Statistical View of the United States...Compendium of the Seventh Census](#), pgs. 8-11; and "Letter From Dr. Edward Jarvis, of Massachusetts, Upon the Classification of Diseases" in [Mortality Statistics of the Seventh Census of the United States, 1850](#), J.D.B. DeBow, (Washington, DC: A.O.P Nicholson), 33rd Cong., 2nd sess., Ex. Doc. No. 98, pgs. 45-48.

¹⁸ Carroll D. Wright, the Commissioner of Labor, accepted the leadership of the Census Office after the departure of Robert P. Porter. Given his new role, Wright oversaw the completion and publication of the final reports 1890 Census reports. To learn more about Carroll D. Wright, see "History: Directors 1893-1909," *U.S. Census Bureau*, last modified January 25, 2021, accessed February 9, 2021, https://www.census.gov/history/www/census_then_now/director_biographies/directors_1893_-_1909.html.

¹⁹ Carroll D. Wright (Commissioner of Labor), *The History and Growth of the United States Census...* (Washington, D.C., GPO, 1900), 56th Cong., 1st sess., Senate, No. 194, pg. 98.

²⁰ Francis A. Walker, Superintendent of the Census, [The Vital Statistics of the United States...From the Original Returns of the Ninth Census, \(June 1, 1870\)...](#) (Washington, D.C., GPO, 1872), pgs. v-viii.

²¹ John Shaw Billings (Surgeon-U.S. Army), Department of the Interior: Census Office, [Report on the Mortality and Vital Statistics of the United States as Returned at the Tenth Census \(June 1, 1880\)](#) (Washington, D.C., GPO, 1885), pt. 1, pg. xi.

²² John Shaw Billings (Surgeon-U.S. Army), Department of the Interior: Census Office, [Report on the Mortality and Vital Statistics of the United States as Returned at the Tenth Census \(June 1, 1880\)](#) (Washington, D.C., GPO, 1885), pt. 1, pgs. xi-xii.

²³ "[Letter from Dr. Edward Jarvis, of Massachusetts, Upon the Classification of Diseases](#)" in *Mortality Statistics of the Seventh Census of the United States*, 1850, pgs. 45-46.

²⁴ Although the historical record is unclear about how or why the Census Office included Washington D.C., Baltimore, Philadelphia, New York City, Brooklyn, and Boston as subjects in one of three special reports about vital and social statistics, Billings noted these cities had an efficient registration system and knowledgeable physicians or a local medical board that could share their own collection of vital statistics. Additionally, these six cities had some of the largest populations in the U.S. and were geographically close to each other. For more information, see John S. Billings, M.D., (Deputy Surgeon-General, U.S. Army (Retired))..., Department of the Interior: Census Office, [Report on Vital and Social Statistics in the United States at the Eleventh Census: 1890...Cities of 100,000 Population and Upward](#), (Washington, D.C., GPO, 1896), pgs. 1-2; John Shaw Billings, (Expert Special Agent), Department of the Interior: Census Office, [Vital Statistics of the District of Columbia and Baltimore Covering a Period of Six Years Ending May 31, 1890](#) (Washington, D.C., GPO, 1893), pgs. 1-3; John Shaw Billings (Surgeon U.S. Army, Expert Special Agent), Department of the Interior: Census Office, [Vital Statistics of New York City and Brooklyn Covering a Period of Six Years Ending May 31, 1890](#) (Washington, D.C., GPO, 1894), pgs. 1-3; and John Shaw Billings (Surgeon U.S. Army, Expert Special Agent), Department of the Interior: Census Office, [Vital Statistics of Boston and Philadelphia Covering a Period of Six Years Ending May 31, 1890](#) (Washington, D.C., GPO, 1895), pgs. 1-2.

²⁵ John Shaw Billings (Surgeon-U.S. Army), Department of the Interior: Census Office, [Report on the Mortality and Vital Statistics of the United States as Returned at the Tenth Census \(June 1, 1880\)](#), pg. xvi; John

Shaw Billings (Surgeon U.S. Army, Expert Special Agent), Department of the Interior: Census Office, [*Vital Statistics of New York City and Brooklyn Covering a Period of Six Years Ending May 31, 1890*](#), pg. 1; and “History: Tracts and Block Numbering Areas,” U.S. Census Bureau, last revised August 07, 2020, accessed October 20, 2020, https://www.census.gov/history/www/programs/geography/tracts_and_block_numbering_areas.html.

²⁶ “History: Tracts and Blocking Numbering Areas.”

²⁷ John Shaw Billings, “Mechanical Methods Used in Compiling Data of the 11th U.S. Census...,” in [*Proceedings of The American Association for the Advancement of Science. For the Fortieth Meeting, held at Washington D.C. August 1891*](#), by Frederic W. Putnam, ed. (Permanent Secretary), (Salem: Published by the Permanent Secretary, July 1892), pg. 409; “History: Herman Hollerith,” United States Census Bureau, last revised June 26, 2020, accessed October 21, 2020, https://www.census.gov/history/www/census_then_now/notable_alumni/herman_hollerith.html; “Count Me In,” United States Patent and Trademark Office, last modified January 31, 2020, accessed October 21, 2020, <https://www.uspto.gov/learning-and-resources/journeys-innovation/historical-stories/count-me>; and “History: 1890,” United States Census Bureau, last revised December 17, 2019, accessed October 21, 2020, https://www.census.gov/history/www/through_the_decades/overview/1890.html.

²⁸ On April 11, 1953, President Eisenhower transferred the U.S. Public Health Service and its newly created National Office of Vital Statistics from the Federal Security Administrator to the Department of Health, Education, and Welfare (HEW). HEW became the modern Department of Health and Human Services on May 4, 1980. President Harry Truman, *Reorganization Plan No. 2 of 1946: Federal Security Agency and Department of Labor*, The White House, May 16, 1946, accessed October 30, 2020, <https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title5a-node84-leaf92&num=0&edition=prelim>.

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