Influential Statisticians of Yesteryear Active in the Washington Statistical Society

Michael P. Cohen

American Institutes for Research, Washington, D.C.

Abstract

The Washington Statistical Society (WSS) is the Washington, D.C., area chapter of the American Statistical Association (ASA). It has a rich history that is described on the WSS web pages. In this article, we profile some influential statisticians of yesteryear who were active in WSS. The statisticians profiled are Joseph Adna Hill, the Chief Statistician of the Bureau of the Census and originator of the Huntington-Hill apportionment method; Ewan Clague, the distinguished and long-serving Commissioner of Labor Statistics; Meyer A. Girshick, notable both as an applied statistician and researcher in decision theory and sequential analysis; Morris H. Hansen, considered one of the twentieth century's most influential survey statisticians; Jerome Cornfield, a leader in transforming biostatistics into a subject with major concerns with clinical, biomedical, and epidemiological research; Margaret E. Martin, a key person in the development of the federal statistical system; Samuel W. Greenhouse, a pioneer in the use of statistical methods in epidemiological research and clinical trials; W. Edwards Deming, the renowned quality management expert; and Joseph Waksberg, a major developer of modern statistical survey methods.

1. Introduction

THE WASHINGTON STATISTICAL SOCIETY (WSS) is the Washington, D.C., area chapter of the American Statistical Association (ASA). It has a membership and level of activity that rivals most national statistical organizations. The WSS traces its roots back to New Year's Eve, 1896, when informal ASA meetings began taking place in the nation's capital. It was formally organized in 1926 as a branch of the ASA. The WSS is an affiliate of the Washington Academy of Sciences.

For the complete history of the WSS, see Allen and Conklin (2012). In this article, we profile some influential statisticians of the past who were active in WSS.

2. Influential Statisticians of Yesteryear Active in WSS

Among statisticians who worked in the Washington, D.C., area, some achieved national and international renown. Here we profile the ones who took the time and energy to be active in their local statistical organization, the WSS. This being a historical account, we only include those deceased 2012 or before. They are discussed here in order of their key role in WSS.

2.1 Joseph Adna Hill (1860-1938)

Joseph A. Hill was one of the preeminent statisticians of his era and deserves to be better known today. Originally from New Hampshire, he did his undergraduate and master's degree work at Harvard University (Williams, 1900, p. 34). He then travelled to Germany for doctoral study, receiving a Ph.D. from the University of Halle (now called Martin Luther University Halle-Wittenberg) in 1892. The same year, he published the journal article "The Prussian Income Tax" (Hill, 1892). After returning from Germany, he translated into English from German the book *A History of the Political Economy* by Gustav Cohn (1894). After several years teaching at Harvard and the University of Pennsylvania, he returned to Europe to investigate European methods of taxation for the Massachusetts Tax Commission (American Biographical Directories, 1908). The trip resulted in the book *The English Income Tax with Special Reference to Administration and Method of Assessment* (Hill, 1899).

In 1898, Hill went to work as a statistician for the Bureau of the Census, the beginning of a long and extremely productive career there (Hall, 1912, p. 448). He became their Chief Statistician in 1909 and Assistant Director in 1921 (Census Bureau, undated). He oversaw the writing and publication of numerous book-length reports on special U.S. populations based on unpublished Bureau of the Census data. To name just a few, there are reports on child labor (Hill, 1907a); women at work (Hill, 1907b); benevolent institutions (United States Bureau of the Census, Hill, Bliss, and Koren, 1911); immigrants (Dillingham, Hill, and Parmelee, 1911); the blind (Brown and Hill, 1915); and prisoners (Hill, Hunt, and Mead, 1926).

As specified in the U.S. Constitution, representatives to the U.S. House of Representatives are apportioned among the states based on data from the Decennial Census carried out by the Bureau of the Census. The U.S. Constitution does not specify, however, the precise method to use. As the Chief Statistician, it is natural that Hill would be interested in

apportionment. In a report to Congress, Hill (1911) described a new method of apportionment. Hill's criterion was to keep the number of representatives per person in the population as equal as possible among the states. The Harvard mathematics professor Edward V. Huntington (1921) showed that the apportionment meeting Hill's criterion was unique and provided an algorithm for computing it. The method is now called the Huntington-Hill method or the method of equal proportions. In 1941, Congress passed and President Roosevelt signed into law a statute making the Huntington-Hill method the required method for apportioning the U.S. House of Representatives, a statute that is still in effect (Young, 2004, pp. 15-16). For some recent insights into the Huntington-Hill method, see Wright (2012, 2014). Hill had one more publication on apportionment. In Hill (1920), he described the apportionments depending on the total number of Representatives in the House (which was not fixed at that time).

Joseph Adna Hill was WSS President from 1926 to 1928. He was the first WSS President after WSS was formally organized as a branch of the ASA.

2.2 Ewan Clague (1896-1987)

Ewan Clague was one of the 20th Century's most accomplished and successful statistical administrators and leaders. From Prescott, Washington, Clague got his undergraduate education from the University of Washington and then served in the U.S Army ambulance service in France during World War I. He later earned a doctorate in economics from the University of Wisconsin. During the New Deal's first years, Clague moved to Washington, D.C., and began his government career. He was hired to work at the new Social Security Board and later became its Director. From there he became the Director of the Bureau of Employment Security. President Truman appointed Clague Commissioner at the Bureau of Labor Statistics (BLS) in 1946. He was later re-appointed by Presidents Eisenhower and Kennedy and also served under President Johnson (Bureau of Labor Statistics, 2012). Clague became Commissioner during a contentious period (because of the World War II price controls), but he came to be regarded favorably by both business and labor because of his integrity, concern for accuracy, and administrative skills (*Los Angeles Times*, 1987). Clague did not like getting individual credit for the accomplishments of BLS, stating "I am no high-powered statistician, but I have some of the best in the world working for me." (*New York Times*, 1987).

After retiring as Commissioner, he taught labor economics and statistics for many years at a number of major universities.

Ewan Clague was WSS President from 1936 to 1937.

2.3 Meyer A. Girshick (1908-1955)

Meyer Girshick is renowned for his seminal research contributions to statistical decision theory and sequential analysis, but he was also an accomplished applied statistician. Girshick was born in a small Russian village but immigrated to the United States at age 15. He received his college education, including the doctorate, from Columbia University where he worked under Harold Hotelling (Daley, 1955). He left Columbia in 1937 for a distinguished period of service in the government, including work at the Bureau of Home Economics and the Bureau of Agricultural Economics. Especially noteworthy was his landmark study with Ruth O'Brien and Eleanor Hunt on the physical measurements of 147,000 American boys and girls, a study that had enormous impact on the garment manufacturing industry.

Meyer A. Girshick was WSS Vice President from 1943 to 1944. In 1945, he spent time back at Columbia University to do war-time work adapting sequential analysis to defense-related inspections. In 1947, he spent time at the Census Bureau adapting sequential analysis methods to the control of mass clerical operations. In 1948, he joined the faculty of Stanford as a Professor of Statistics where he had many productive years. He was President of the Institute of Mathematical Statistics (IMS) in 1952. According to David Blackwell and Albert H. Bowker (1955), "Girshick was notable for his receptivity to new concepts…, his tremendous energy and drive, the wealth of new ideas and conjectures he produced, and his persistent and usually successful efforts to get others to work in directions he considered fruitful." Girshick's classic book with Blackwell (1954), *The Theory of Games and Statistical Decisions*, is still in print as a Dover paperback.

2.4 Morris H. Hansen (1910-1990)

According to Benjamin J. Tepping and Joseph Waksberg (the latter also profiled here) (1992), "Morris Hansen was the most influential statistician in the evolution of survey methodology in the twentieth century." He grew up in Wyoming and received his bachelor's degree from the University of Wyoming. After moving to Washington, D.C., to work

for the Census Bureau, he obtained a master's degree in statistics from American University. At the Census Bureau, Hansen brought together a staff that defined and researched the main problems in the conduct of surveys and developed the methods needed to overcome them. He pushed the Census Bureau to innovate; these innovations included the purchase of the first computer for statistical purposes and the development of optical scanning equipment. In collaboration with researchers like William N. Hurwitz, Benjamin J. Tepping, and William G. Madow, Hansen conducted path-breaking research on finite population sampling theory. They developed the concept of *total survey design* that incorporates nonsampling error into the survey design decision process.

After retiring from the Census Bureau, Hansen joined Westat, Inc., where he had key consulting roles in the design of the Consumer Price Index, the Consumer Expenditure Surveys, the National Assessment of Educational Progress, and other major surveys.

Morris H. Hansen was WSS President from 1944 to 1945. He was President of the IMS in 1953 and of the ASA in 1960.

2.5 Jerome Cornfield (1912-1979)

Jerome Cornfield was one of the world's most prominent biostatisticians for over thirty years and was a leader in transforming biostatistics to a subject with major concerns with clinical, biomedical, and epidemiological research (Greenhouse, 1982). He grew up in the Bronx and attended New York University obtaining a bachelor's degree in history (Greenhouse and Halperin, 1980). His only formal training in mathematics and statistics was from the U. S. Department of Agriculture Graduate School where he took courses from, among others, Meyer Girshick, also profiled here. Although best known for his work in biostatistics, Cornfield also made important contributions to economic statistics during the period 1935-1947 when he worked for the Bureau of Labor Statistics. He was a key figure in the 1938-1940 Consumer Price Index revision. He introduced new probability sampling ideas into a wartime study of Family Spending and Saving. Most notable of all was his consultation with the Bureau of Home Economics on the "Diet Problem". The Diet Problem is what we would today call a problem in linear programming. Cornfield defined the problem rigorously and developed a method for obtaining approximate solutions, perhaps the first person to do so for any linear programming problem (Zelen, 1982, p. 12).

In 1947, Cornfield went to work for the statistics unit of the Public Health Service which became part of the National Institutes of Health (NIH). In 1960, he left NIH for Johns Hopkins University but then returned to NIH as an assistant branch chief and then branch chief. He later was a professor at the University of Pittsburgh and The George Washington University.

His biostatistical contributions touched on every major public health issue of the time including smoking and health, the safety of polio vaccines, risk factors for cardiovascular disease, and the estimation of low-dose carcinogenic effects in human beings. In addition to his momentous contributions to major medical and public health issues of the day, Cornfield contributed to research on the foundations of statistics. He also was at the forefront of introducing Bayesian perspectives into biostatistics.

Jerome Cornfield was WSS President from 1949 to 1950. He was President of the ASA in 1974; President of the American Epidemiologic Society, 1972; Vice President of the American Heart Association, 1970; and President of the Eastern North American Region of the International Biometric Society, 1959 to 1960.

2.6 Margaret E. Martin (1912-2012)

Margaret E. Martin played a central role in the development of the modern U.S. government system of official statistics. Born in New York City, she earned a bachelor's degree from Barnard College and master's from Columbia University, both with a major in economics. She worked for a year as a research assistant at Iowa State College and then for two years at Smith College in Massachusetts. While at Smith College, she did research that formed the basis for her Ph.D. dissertation. After earning her doctorate in economics from Columbia University, she worked for a time for the New York state government in Albany. She then moved to Washington, D.C., to work for the Division of Statistical Standards of the Bureau of the Budget (now called the Office of Management and Budget or OMB) where she stayed for 30 years (Straf and Olkin, 1994).

Martin's field of concentration was statistics on employment, unemployment, poverty, and income. She was a member of the group that founded the Current Population Survey. She investigated the disparities among the three major sources of employment and unemployment data: the household based Current Population Survey; the establishment surveys of the Bureau of Labor Statistics; and the insured unemployment data

from the Bureau of Employment Security. She chaired the group that drafted the joint release by the Secretaries of Commerce and Labor on the employment situation each month. In 1961 and 1962, she served as executive secretary to a presidential committee analyzing the national employment statistics. From 1967 to 1973, she headed the portion of the Statistical Policy Division (formerly the Division of Statistical Standards) of the Bureau of the Budget that dealt with employment, unemployment, poverty, and income.

In 1973, Martin retired from federal service to become the founding executive director of the Committee on National Statistics (CNSTAT) of the National Academy of Sciences. She retired as executive director in 1978 but continued to work there part time. She was the sole editor of the first edition of their *Principles and Practices for a Federal Statistical System* (Committee on National Statistics, 1992) and edited or co-edited later editions. This publication is a key resource for the U.S. government system of official statistics. With Stephen E. Fienberg, she edited *Sharing Research Data* (Committee on National Statistics, 1985).

Margaret E. Martin was WSS President from 1957 to 1958. She was ASA President in 1980. She passed away in 2012 at the age of 100.

2.7 Samuel W. Greenhouse (1918-2000)

Samuel W. Greenhouse was a pioneer in the use of statistical methods in research in epidemiology and in the theory and practice of clinical trials. He received his bachelor's degree in mathematics from the City College of New York and went to work for the Bureau of the Census, working with W. Edwards Deming, also profiled here, from 1940 to 1942. He served in the Army during World War II and then worked for the United Nations Relief and Rehabilitation Agency, 1945 to 1948. In 1948, he was recruited to be one of the founding members of the first biometry group at the National Institutes of Health (NIH) (Lachin and Greenhouse, undated). He also taught part-time and pursued his own graduate degrees under Professor Solomon Kullback at The George Washington University, receiving his Ph.D. in Mathematical Statistics in 1959.

Greenhouse's biostatistical research contributions included work on diagnostic tests with applications to noninvasive methods for cancer screening; methods for analyzing highly correlated psychological data with applications to the study of human aging; the sequential analysis of emerging data in clinical trials; and the use of logistic regression in matched and unmatched case-control studies. He collaborated with Joseph

Gastwirth on a class of problems arising in both legal settings and epidemiological studies. Greenhouse was a strong believer in close collaborations with medical scientists and worked with researchers in cancer, mental health, fertility, and cardiology, among other areas. He worked for the National Cancer Institute, the National Institute of Mental Health, the National Institute of Child Health and Human Development, and The George Washington University.

Samuel W. Greenhouse was WSS President 1967 to 1968. He also served as President of the Eastern North American Region of the International Biometric Society (Greenhouse, 1997).

2.8 W. Edwards Deming (1900-1993)

Although he came to be world renowned as a "guru" or "prophet" of quality management, W. Edwards Deming considered himself a "Consultant in Statistical Studies" (Mann, undated). Deming was born in Sioux City, Iowa, and grew up in Iowa and Wyoming. He graduated from the University of Wyoming with a degree in engineering. He got a master's degree from the University of Colorado, studying mathematics and physics (Holusha, 1993). He received a Ph.D. from Yale in mathematical physics, specializing in the kinetic theory of gases. Even before formally earning his Ph.D., he began work at the Fixed Nitrogen Research Laboratory of the U.S. Department of Agriculture where he stayed for about 11 years and produced 38 publications, most having to do with the physical properties of matter.

He gradually became interested in statistics, and in 1936 went to London to study with Ronald A. Fisher. While there, he met and attended lectures by Jerzy Neyman on survey sampling. In 1939, he joined the Census Bureau as Head Mathematician and Adviser in Sampling. His role was to help develop a sampling component to the 1940 population census, a radical idea at the time. In 1940, his important paper with Stephan was published which developed "raking," the application of iterative proportional fitting to the weighting of survey data (Deming and Stephan, 1940).

In 1946, Deming was asked to go to Japan by the War Department to study agricultural and other problems to help Japan recover from the war. He returned to Japan a number of times after that and developed friendships and influence with the new Japanese managers who had become prominent after the war. His ideas about quality were influenced by his admiration of and friendship with Walter A. Shewhart of Bell

Laboratories and further developed in, *e.g.*, Deming's books *The New Economics: For Industry, Government, Education* (Deming, 1993) and *Out of the Crisis* (Deming, 2000).

W. Edwards Deming was WSS Physical Science and Engineering Chairperson from 1966 to 1967 and WSS Methodology Section Chairperson from 1970 to 1971. He was President of the IMS in 1945.

2.9 Joseph Waksberg (1915-2006)

Joseph Waksberg was "… instrumental in developing and implementing sampling and estimation methods that greatly contributed to survey research…. [He] left a legacy of innovative methods and applications…" (Brick and Tucker, 2007). Waksberg was born in what is now Poland, but his family immigrated to the United States when he was about 6 years old. He graduated from the City College of New York with a major in mathematics in 1936 at the height of the depression. He took graduate courses at New York University in the evening while looking for long-term employment. But Waksberg scored high on the federal civil service examination in mathematics and was offered a job in Washington, D.C., with the Navy Department (Morganstein, Marker, and Waksberg, 2000). After his Navy project was completed, he went to work for the Census Bureau under Morris Hansen, also profiled here. He stayed at the Census Bureau for 33 years, retiring as an associate director. Two examples of the innovations he introduced were list sampling combined with building permit tracking for the Current Population Survey and four-year rotation sampling for the Annual Housing Survey.

Waksberg's best known research was in telephone sampling methods. He took an idea for random digit dialing (RDD) that had been proposed and used by his close friend Warren Mitofsky at CBS and developed its statistical properties in his seminal 1978 *JASA* paper, "Sampling Methods for Random Digit Dialing." The Mitofsky-Waksberg RDD approach prevailed in telephone sampling for many years. Later, when technological changes lessened the efficacy of the method, Waksberg did important research in list-assisted telephone sampling. After retiring from the Census Bureau, Waksberg had a long second career at Westat, Inc., eventually becoming Chairman of the Board there.

Joseph Waksberg was WSS President from 1974 to 1975.

3. Summary

The following nine statisticians of the past were profiled in this article, having been active in the Washington Statistical Society in the Washington, D.C., area (seven of this group, for example, served as WSS presidents):

- Joseph Adna Hill
- Ewan Clague
- Meyer A. Girshick
- Morris H. Hansen
- Jerome Cornfield
- Margaret E. Martin
- Samuel W. Greenhouse
- W. Edwards Deming
- Joseph Waksberg

Each of these statisticians was influential in his or her career. **Hill** was Chief Statistician of the Bureau of the Census and originator of the Huntington-Hill apportionment method. **Clague** was a distinguished and long-serving Commissioner of Labor Statistics. **Girshick** was notable both as an applied statistician and as a researcher in decision theory and sequential analysis. **Hansen** is considered one of the twentieth century's most influential survey statisticians. **Cornfield** was a leader in transforming biostatistics into a subject with major concerns with clinical, biomedical, and epidemiological research. **Martin** was a key person in the development of the federal statistical system. **Greenhouse** was a pioneer in the use of statistical methods in epidemiological research and clinical trials. **Deming** is a renowned quality management expert. **Waksberg** was a major developer of modern statistical survey methods.

Acknowledgements

A very special thanks goes to Rich Allen for organizing, researching, and writing *Washington Statistical Society, Past and Present*. The work of Joseph Conklin in updating it is also greatly appreciated.

References

American Biographical Directories (1908). *District of Columbia*, Washington, D.C.: The Potomac Press, http://archive.org/stream/districtofcolumb00macf/districtofcolumb00macf_djvu.txt

Allen, Rich, and Conklin, Joseph (2012). *Washington Statistical Society, Past and Present, 1986-2012*, http://washstat.org/12book.pdf

Blackwell, David, and Bowker, Albert H. (1955). "Meyer Abraham Girshick 1908-1955," *Annals of Mathematical Statistics*, 26, 3, 365-367.

Blackwell, David, and Girshick, Meyer A. (1954). *Theory of Games and Statistical Decisions,* New York: Wiley (Republished by Dover Publications).

Brick, J. Michael, and Tucker, Clyde (2007). "Mitofsky-Waksberg, Learning from the Past," *Public Opinion Quarterly*, 71, 5, 703-716.

Brown, Reginald L., and Hill Joseph A. (1915). *The Blind Population of the United States 1910*, Washington DC: U.S. Government Printing Office.

Bureau of Labor Statistics (2012). "Ewan Clague: August 1946-September 1965," *Commissioners*, http://www.bls.gov/bls/history/commissioners/clague.htm

Census Bureau (undated). "Joseph Adna Hill," https://www.census.gov/history/www/census_then_now/notable_alumni/joseph_adna_hill.html

Cohn, Gustav (1894). *A History of the Political Economy* (translated by Joseph Adna Hill), Philadelphia: American Academy of Political and Social Science.

Committee on National Statistics (1985). *Sharing Research Data,* eds. Stephen E. Fienberg and Margaret E. Martin, Washington DC: National Academy Press.

Committee on National Statistics (1992). *Principles and Practices for a Federal Statistical Agency* (1st ed.), ed. Margaret E. Martin, Washington DC: National Academy Press.

Daly, Joseph F. (1955). "Meyer Abraham Girshick 1908-1955," *American Statistician*, 9, 3, 6.

Deming, W. Edwards (1993). *The New Economics for Industry, Government, and Education*, Cambridge MA: MIT Press.

Deming, W. Edwards (2000). *Out of the Crisis,* Cambridge, MA: MIT Press.

Deming, W. Edwards, and Stephan, Frederick F. (1940). "On a Least Squares Adjustment of a Sampled Frequency Table When the Expected Marginal Totals Are Known," *Annals of Mathematical Statistics*, 11, 4, 427-444.

Dillingham, William Paul, Hill, Joseph A., and Parmelee, Julius H. (1911). *Occupations of First and Second Generations of Immigrants in the United States*, Washington DC: U.S. Government Printing Office.

Greenhouse, Samuel W. (1982). "A Tribute," Proceedings of "Current Topics in Biostatistics and Epidemiology," A Memorial Symposium in Honor of Jerome Cornfield (*Biometrics* Supplement), 38, 3-6.

Greenhouse, Samuel W. (1997). "Some Reflections on the Beginnings and Development of Statistics in 'Your Father's NIH,'" *Statistical Science*, 12, 2, 82-87.

Greenhouse, Samuel W., and Halperin, Max (1980). "Jerome Cornfield, 1912-1979," *American Statistician*, 34, 2, 106-107.

Hall, Clayton Coleman (ed.) (1912). *Baltimore: Its History and Its People*, Volume II, New York: Lewis Historical Publishing Company.

Hill, Joseph Adna (1892). "The Prussian Income Tax," *Quarterly Journal of Economics*, 6, 1, 207-225.

Hill, Joseph Adna (1899). *The English Income Tax with Special Reference to Administration and Method of Assessment*, New York: Macmillan.

Hill, Joseph Adna. (1907a). *Child Labor in the United States, Based on Unpublished Information Derived from the Schedules of the Twelfth Census: 1900*, Washington, D.C.: U.S. Government Printing Office.

Hill, Joseph Adna (1907b). *Statistics of Women at Work*, Washington, D.C.: U.S. Government Printing Office.

Hill, Joseph Adna (1911). "Method of Apportioning Representatives," *Sixty-Second Congress, First Session, House Reports*, 1, 12, 43-108.

Hill, Joseph Adna. (1920). *Apportionment of Each Number of Representatives from 435 to 483*, Washington, D.C.: U.S. Government Printing Office.

Hill, Joseph Adna, Hunt, William C., and Mead, Bennet Loomis (1926). *Prisoners 1923*, Washington, D.C.: U.S. Government Printing Office.

Holusha, John (1993). "W. Edwards Deming, Expert on Business Management, Dies at 93," *New York Times Archives*, http://www.nytimes.com/1993/12/21/obituaries/w-edwards-deming-expert-on-business-management-dies-at-93.html

Lachin, John M., and Greenhouse, Joel (undated). "Samuel W. Greenhouse, 1918-2000," *Statisticians in History*, http://www.amstat.org/about/statisticiansinhistory/index.cfm?fuseaction=bios

Los Angeles Times (1987). "Ewan Clague, Ex-Labor Data Official, Dies," *Times Wire Services*, http://articles.latimes.com/1987-04-16/news/mn-502_1_ewan-clague

Mann, Nancy R. (undated). "W. Edwards Deming, 1900-1993," *Statisticians in History*, http://www.amstat.org/about/statisticiansinhistory/index.cfm?fuseaction=bios

Morganstein, David, Marker, David, and Waksberg, Joseph (2000). "A Conversation with Joseph Waksberg," *Statistical Science*, 15, 3, 299-312.

New York Times (1987). "Ewan Clague, 90; U.S. Labor Official," *New York Times Archives*, http://www.nytimes.com/1987/04/15/us/ewan-clague-90-us-labor-official.html

Straf, Miron, and Olkin, Ingram (1994). "A Conversation with Margaret Martin," *Statistical Science*, 9, 1, 127-148.

Tepping, Benjamin J., and Waksberg, Joseph (1992). "Morris H. Hansen, 1910-1990," *International Statistical Review*, 60, 1, 3-4.

United States Bureau of the Census, Hill, Joseph Adna, Bliss, Edwin M., and Koren, John (2011). *Benevolent Institutions*, Washington, D.C.: U.S. Government Printing Office.

Waksberg, Joseph (1978). "Sampling Methods for Random Digit Dialing," *Journal of the American Statistical Association*, 73, 361, 40-46.

Williams, Henry Morland (1900). *Secretary's Report No. V., Harvard College Class of 1885*, Boston: Rockwell and Churchill Press.

Wright, Tommy (2012). "The Equivalence of Neyman Allocation for Sampling and Equal Proportions for Apportioning the U.S. House of Representatives," *American Statistician*, 66, 4, 217-224.

Wright, Tommy (2014). "Lagrange's Identity and Congressional Apportionment," *American Mathematical Monthly*, 121, 6, 523-528.

Young, H. Peyton (2004). "Fairness in Apportionment," https://www.census.gov/history/pdf/Fairness_in_Apportionment_Young.pdf

Zelen, Marvin (1982). "The Contributions of Jerome Cornfield to the Theory of Statistics," Proceedings of "Current Topics in Biostatistics and Epidemiology," A Memorial Symposium in Honor of Jerome Cornfield (*Biometrics* Supplement), 38, 11-15.

Bio

Michael P. Cohen is a Principal Sampling Statistician at the American Institutes for Research. He is a retired federal employee and former President of the Washington Academy of Sciences (WAS) and of the Washington Statistical Society. Dr. Cohen is a Fellow of the American Educational Research Association, the American Statistical Association (ASA), the Royal Statistical Society, and the WAS. He is an Elected Member of the International Statistical Institute and Sigma Xi. He is a member and vice chair of the ASA Committee on Archives and Historical Materials.