

September 2020 • Issue #519

AMSTATNEWS

The Membership Magazine of the American Statistical Association • <http://magazine.amstat.org>

Getting Started in **DATA** for *Good*

ALSO:

Celebrating Hispanic
Heritage Month

Data for Good Tech:
Cool Science, Hot
Projects





DID YOU KNOW?

SAS/STAT[®] 15.1 OFFERS BRAND-NEW CAPABILITIES.

SAS/STAT 15.1 HIGHLIGHTS

Bayesian generalized linear mixed models.

Causal graph analysis.

Regression for time-to-event data based on restricted mean survival time.

Counterfactual analysis using quantile regression.

Semiparametric proportional hazards model for interval-censored data.

Recent SAS/STAT ADDITIONS

Causal mediation analysis.

Compartmental models for pharmacokinetic analysis.

Fast quantile process regression.

Cause-specific proportional hazards analysis for competing-risks data.

Variance estimation by the bootstrap method.

support.sas.com/statistics



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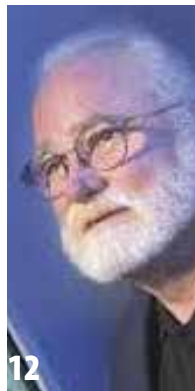
The American Statistical Association is the world's largest community of statisticians. The ASA supports excellence in the development, application, and dissemination of statistical science through meetings, publications, membership services, education, accreditation, and advocacy. Our members serve in industry, government, and academia in more than 90 countries, advancing research and promoting sound statistical practice to inform public policy and improve human welfare.

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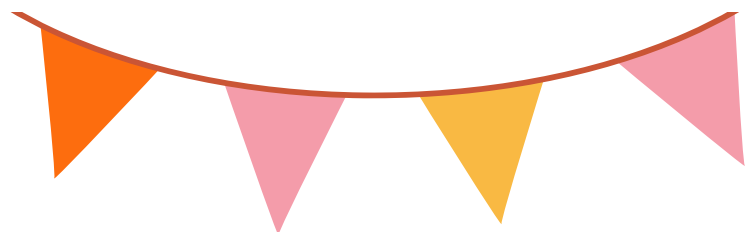


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Data for Public Good: Have You Considered Using Your Training Like This?

STATtr@k is a column in *Amstat News* and a website geared toward people who are in a statistics program, recently graduated from a statistics program, or recently entered the job world. To read more articles like this one, visit the website at <http://stattrak.amstat.org>. If you have suggestions for future articles, or would like to submit an article, please email Megan Murphy, *Amstat News* managing editor, at megan@amstat.org.



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CALL for PAPERS

SBR Special Issue: Statistical Issues and Challenges in Clinical Trials for COVID-19 Treatments, Vaccines, Medical Devices, and Diagnostics—*Statistics in Biopharmaceutical Research (SBR)*, is calling for papers focusing on clinical trials for COVID-19 treatments, vaccines, medical devices, and diagnostics. SBR will accept manuscripts in the form of original research, short communication, perspective, commentary, or a letter to the editor that presents recent statistical issues, challenges, or methodology developments in our knowledge of COVID-19. Manuscripts should be submitted online at <https://mc.manuscriptcentral.com/statsbr>. Visit <https://magazine.amstat.org> for details.

C.R. Rao's Birth Centenary Celebration



In celebration of the birth centenary of the "living legend" of 20th century statistics, some of C.R. Rao's students, former colleagues, friends, and admirers started a Facebook Page, "Dr. C.R. Rao's Birth Centenary Celebration," to celebrate his 100th birthday virtually. All members of the ASA interested in participating in this celebration are encouraged to join the group at www.facebook.com/groups/1604465816396606.

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Everyone Counts: Data for the Public Good

When we selected the theme for JSM 2020, we could not have imagined the events that would make the world community so aware of our work to ensure data is available and used for the public good. Paraphrasing the prospectus for the proposed *United States Statistical Journal* written by our association's founders in 1843: Our science gives form to the realities of the present and the past and serves as a guide to the future. In this special issue, you will read about the important work being done by our many talented colleagues. In that spirit, I am using this President's Corner to share with you thoughts from my vantage point as ASA president.

To begin, I want to acknowledge my colleagues who work as part of the federal statistical agencies. As stated in the *Principles and Practices for a Federal Statistical Agency* (www.nap.edu/read/24810/chapter/1): “Even more broadly, the effective operation of a democratic system of government depends on the unhindered flow of impartial, scientifically based statistical information to its citizens on a wide range of issues, including employment, growth in the economy, the cost of living, crime victimization, family structure, physical and mental

health, educational attainment, energy use, and the environment.” All sectors depend on the data and analysis made available through the work of the federal statistical agencies. If you did not attend the President's Invited Speaker session at JSM, I recommend you watch the recording. Erica Groshen gave an amazing talk, “The Future of Federal Statistics.”

Ensuring data is used for public good depends on ethical practice. I think you probably know by now that ethics is a passion of mine (<https://bit.ly/3kGXi0K>), and it has never been so important that we as a profession follow and advocate for ethical practices, especially when using data analysis for the public good. I am proud of the work done by the ASA Committee on Professional Ethics in support of the Ethical Guidelines for Statistical Practice (<https://bit.ly/3kLp2Sj>). I encourage you to visit the committee's website (<https://community.amstat.org/ethics/home>), which has a rich repository of resources. Please also take time to provide input to the committee on potential revisions for the guidelines (<https://bit.ly/33RE4j4>). In 2021, the committee will begin the formal writing process for revisions of the guidelines, so this is a critical time for you to provide input.

Guidelines for ethical practice are essential, but we also need to make contributions to the broader data ethics conversation. We are happy to announce that the three ASA presidents are forming an Anti-Racism Task Force as I write this column (with Donna LaLonde's help). The charge of the task force is to help the ASA reach the goals outlined in our statement found at <https://bit.ly/2Cr8LAA>. The detailed charge is on the website (<https://bit.ly/3ixEkIf>), but we highlight the following task because it relates to data ethics:

Propose mechanisms to the Board through which the association will inform the public on the responsible use of statistics and data science in systems that can unintentionally contribute to widespread racial and ethnic bias in society, such as facial recognition algorithms, predictive policing, and machine learning optimization algorithms, etc. Also propose how statistics should be used to support anti-racist systems.

This charge reinforces the critical role for statisticians and data scientists to ensure the ethical use of data—in the present and in the future. As statisticians and data scientists, we are



Wendy Martinez



SDSS
SYMPOSIUM ON
DATA SCIENCE & STATISTICS
ST. LOUIS, MISSOURI • JUNE 2–5, 2021

JOIN THE CONVERSATION!

The program committee is accepting submissions from October 1 to November 23 in the following tracks.

- Computational Statistics
- Data Visualization
- Education
- Machine Learning
- Practice and Applications
- Software & Data Science Technologies

Visit ww2.amstat.org/meetings/sdss/2021.

responsible for not only ensuring ethical practice, but also for contributing to the public understanding of the complex issues.

If you know me, then you know I am a data challenge advocate. Not only are they educational and fun, but they provide an opportunity to expand the community of individuals engaged in thinking about data for the public good, as the challenge data sets often come from government sources (i.e., public data).

I am excited to give you a preview of the upcoming 2021 Data Challenge Expo, which is sponsored by three ASA sections: Statistical Computing,

Government Statistics, and Statistical Graphics. A special thank you to Juergen Symanzik (Utah State University) for coming up with the idea and making the connections for us. I also thank Anna Valuev and Lorena Molina-Irizarry (US Census Bureau) for their efforts setting this up and making it a meaningful event for contestants. See <https://bit.ly/3gUylNo> and <https://bit.ly/33UPHG6> for information about past ASA data challenges.

The data set for the 2021 Data Challenge Expo is being provided by the Census Bureau in partnership with The Opportunity Project (TOP), whose tag line is “Putting America’s data to work for the people.” For this challenge, the Census Bureau will identify a core data set that contestants will use as the focus of their statistical and visualization efforts. To accompany the data, our Census Bureau colleagues will provide a problem statement to help frame the efforts around challenges faced by communities nationwide. See <https://opportunity.census.gov/sprints> for past TOP problem statements and other challenge opportunities. Note that past TOP

projects were not related to our ASA Data Challenge Expo. The 2021 challenge is the first time for our partnership with TOP and the Census Bureau.

Contestants will follow the typical ASA Data Challenge Expo process (<https://bit.ly/3gUylNo>) and submit an abstract to be presented at JSM 2021. Keep an eye out for details about the steps to enter the contest. We will make announcements through the usual ASA news channels in October.

The geographer Joni Seager wrote, “What gets counted counts.” As statisticians and data scientists, we need to play a leadership role to ensure everyone counts and data is used for the public good. We are already looking forward to JSM 2021 with the theme “Statistics, Data, and the Stories They Tell.” I am grateful that our community will play a leadership role in telling stories that ensure everyone counts and data is used for the public good.



“
What gets counted counts.”

—Joni Seager, Geographer

Proposed Revisions to the ASA Constitution and Bylaws

Ron Wasserstein, ASA Executive Director

Recognizing that the ASA's primary governance documents had not been reviewed since the turn of the century, ASA President Wendy Martinez appointed a committee consisting of former ASA President Bob Rodriguez, ASA Vice President Kathy Monti, former Council of Chapters Chair Paul Roberson, former Council of Sections Chair Paula Roberson, and me to undertake this task. The charge was not to overhaul the documents—there did not seem to be a need to do so—but rather to match them up with the current ASA practices.

The changes you will find to the ASA constitution and bylaws on the following pages are put forward in that spirit. They were recommended by the committee and reviewed and approved for member review by the ASA Board of Directors. Where we thought it might be helpful, marginal comments briefly explain the reason for making a particular change. Taken as a whole, the changes will bring our governance documents up to date.

The board will vote in late November on accepting these changes. Per the rules set forth by our constitution and bylaws, the board seeks comments from ASA members on the proposed changes. Please send comments to me at ron@amstat.org by November 15, 2020.

Constitution (1)

Constitution of the American Statistical Association
(Effective ~~January 1, 1999~~ TBD)

Article I. NAME
The name of this organization is the American Statistical Association.

Article II. OBJECTIVES
~~The objectives of the American Statistical Association are to promote the practice and profession of statistics, envisioning a world that relies on data and statistical thinking to drive discovery and inform decisions. The objectives of the American Statistical Association are to foster statistics and its applications, to promote unity and effectiveness of effort among all concerned with statistical problems, and to increase the contribution of statistics to human welfare. The ASA is a non-profit organization and achieves these objectives by supporting excellence in the development, application, and dissemination of statistical science through meetings, publications, membership services, education, accreditation, and advocacy. The ASA advances research and promotes sound statistical practice to inform public policy and improve human welfare. The American Statistical Association is a nonprofit organization and achieves these objectives by conducting meetings, producing publications devoted to statistical methodology, and its applications, and making available information concerning the science of statistics and its contributions. It also cooperates with other organizations in the advancement of statistics, stimulates research, promotes high professional standards and integrity in the application of statistics, fosters education in statistics, and in general, makes statistics of service to society. Statistics is a continually evolving field, and the ASA strives to be the professional home for all those who learn from data – The Big Tent for Statistics and Data Science.~~
The ASA establishes professional standards of ethics and conduct so that these objectives are pursued without prejudice toward any person or group.

Article III. MEMBERSHIP
The Association may have one or more categories of members, as defined in Article I of the ~~By-Laws~~ ASA Bylaws.
Except as otherwise provided by this Constitution and the ~~ASA By-Laws~~ Bylaws, only ~~full individual members, as defined by Article I of the Bylaws, have the right to vote, to sign referendum petitions, to hold office, and to sign nominating petitions~~ shall be reserved to full members, as defined in Article I of the By-Laws.

Article IV. CHAPTERS
Members within a specific geographic area may form a chapter to develop and explore ways of pursuing the objectives of the Association. Responsibility for chartering and overseeing chapters rests with the Council of Chapters.

Commented [WR1]: Updated to reflect mission and vision statements

Commented [WR2]: Updated to reflect current description of the ASA

Commented [WR3]: Without this edit there is no information on how we pursue these objectives without prejudice.

Commented [WR4]: Changing from "full member" to "individual member" (or just "member," when there is no ambiguity) to avoid the suggestion that some members have limited rights

Constitution (2)

The Council of Chapters functions under a charter approved by the Board of Directors to serve the needs of the chapters. As part of this function, it channels information between the Association and the chapters and promotes cooperation among the chapters. It also provides oversight for chapter activities, including formation and dissolution of chapters, and ensures that chapter activities, including fiscal management, are consistent with the goals of the Association.

The ~~Council~~ council shall consist of ~~Chapter~~ chapter representatives and ex officio members as described in the charter of the Council of Chapters and elsewhere in the Constitution and ~~By-Laws~~ Bylaws.

Article V. SECTIONS
Members may form a section in order to further the objectives of the Association in a field of statistical methods, theory, or applications. The scope of a section shall be sufficiently broad to represent active professional interests of a substantial segment of the Association. Responsibility for chartering and overseeing sections rests with the Council of Sections.

The Council of Sections functions under a charter approved by the Board of Directors to serve the needs of the sections. As part of this function, it channels information between the Association and the sections and promotes cooperation among the sections. It also provides oversight for section activities, including formation and dissolution of sections, and ensures that section activities, including fiscal management, are consistent with the goals of the Association. The Council shall consist of section representatives and ex officio members as described in the charter of the Council of Sections and elsewhere in the Constitution and ~~By-Laws~~ Bylaws.

~~In the previous paragraph, the term "sections" is understood to cover any and all entities that operate under the charter of the Council of Sections.~~

Article VI. BOARD OF DIRECTORS
The Board of Directors is the policy-making and legislative body of the Association. It shall consist of sixteen members, which use President, President-Elect, Past President, three Vice Presidents, three representatives of ~~from~~ the Council of Chapters, three representatives of ~~from~~ the Council of Sections, International Representative, Secretary, Treasurer, and Publication Representative. ~~The Secretary and Treasurer are ex officio members without vote. All voting members of the Board of Directors and the Treasurer must be full individual members of the Association for the five years preceding the start of their term of office. An employee of the Association, with the exception of the Secretary, may serve as a member of the Board of Directors.~~

The President, President-Elect, Past President, Vice Presidents, representatives of the Council of Chapters, representatives of the Council of Sections, International Representative, and Publication Representative shall be collectively known as the ~~at-large~~ voting Board members. The Secretary and Treasurer are ex officio members without vote. All voting members of the Board of Directors and the Treasurer must be individual members of the Association for the five years preceding the start of their term of office.

~~No employee of the Association, with the exception of the Secretary, may serve as a member of the Board of Directors~~

Commented [WR6]: At present this refers to interest groups but leaves room in the description should other entities be created later

Commented [WR7]: This Article reorganized to improve clarity

Commented [WR8]: Eliminates some ambiguity about the meaning of "at-large," addresses what is actually meant

Constitution (3)

Article VII. EXECUTIVE COMMITTEE
The Executive Committee shall consist of the President, President-Elect, Past President, senior Vice President, Secretary, and Treasurer. The Secretary and Treasurer are ex officio members without vote.

Article VIII. OFFICERS
The officers of the Association shall be the President, President-Elect, Past President, three Vice Presidents, Secretary, and Treasurer.

Article IX. METHOD OF SELECTION
All full individual members shall be eligible to vote for every elected position on the Board of Directors.
Nominees for the positions of President-Elect and Vice President are selected by the Committee on Nominations as described in Article V, Section 1 of the ~~By-Laws~~ Bylaws.
The Council of Chapters shall nominate candidates for its representatives to the Board of Directors to be elected by a vote of all full members. Each of the three geographic regions, as established by the charter of the Council of Chapters, shall still have one representative to the Board of Directors.
The Council of Sections shall nominate candidates for its representatives to the Board of Directors to be elected by a vote of all full members.
The Board-appointed editors shall nominate candidates for the Publication Representative to the Board of Directors to be elected by a vote of all full members.
The International Representative shall be elected by a vote of all full members. Candidates for International Representative shall be nominated as specified in Article V, Section 1 of the ~~By-Laws~~ Bylaws.
The Secretary and Treasurer shall be selected according to Article V, Section 2 of the ~~By-Laws~~ Bylaws.

Article X. TERMS OF OFFICE
The President is elected to the position of President-Elect and normally serves a three-year term. The first year will be as President-Elect, the second year as President, and the third year as Past President. One elected to the position of President-Elect, the incumbent shall normally serve a three-year term. The first year shall be as President-Elect, the second year as President, and the third year as Past President. One individual has served as ASA President, that person cannot again be nominated for nor serve as ASA President-Elect.

The Vice Presidents shall be elected for three-year terms, one Vice President being elected each year. No Vice President shall be eligible for immediate re-election to the same office.

Commented [WR9]: This edit replaces an awkward sentence in which the word "incumbent" was used incorrectly.

Commented [WR10]: (1) The other positions have a restriction against immediate re-election but president does not (2) It seems reasonable not to allow someone to serve twice as president, and that is our practice anyway

Constitution (4)

The representatives of the Council of Chapters ~~shall~~ serve a three-year term, one representative being elected each year.

The representatives of the Council of Sections ~~shall~~ serve a three-year term, one representative being elected each year.

No Chapter or Section Representative completing a full term ~~shall be~~ eligible for immediate re-election to the same office.

The International Representative ~~shall be~~ eligible for a three-year term and ~~shall not be~~ eligible for immediate re-election to the same office.

~~The Treasurer is appointed to a three-year term as provided for in Articles V and VII of the ASA Bylaws. The Treasurer may not be immediately reappointed to same office.~~

~~The Board of Directors sets the term of office for the Secretary, who also serves as the ASA's Executive Director, as provided for in Articles V and VII of the Bylaws. The Secretary is appointed to an original term of no more than five years, and upon action of the Board of Directors may be reappointed at any time during the Secretary's term for a period of up to five years from the date the reappointment takes effect. The Board of Directors shall fix the terms of office of five years or less for the Secretary and the Treasurer. The Secretary and the Treasurer may be re-appointed to the same office.~~

Commented [WR11]: Makes the Treasurer position on the board similar to other board positions regarding term and reappointment

Commented [WR12]: Describes the long-standing practice of appointment and reappointment of the Executive Director more clearly.

Constitution (5)

The Publication Representative ~~shall~~ serve a three-year term and ~~shall not be~~ eligible for immediate re-election to the same office.

The Board of Directors may provide shorter terms during periods of organizational transition.

Terms of office ~~shall~~ end, and new terms ~~shall~~ begin, on January 1, but each office holder ~~shall~~ serve until a successor takes office.

No elected individual may serve simultaneously in two capacities on the Board of Directors.

Article XI. COMMITTEES

The committees of the Association ~~shall~~ consist of the Executive Committee and other committees of the Board of Directors, which are named in the ~~By-Laws/Bylaws~~; ~~Standing~~ ~~standing~~ ~~Committees/committees~~, which are named in the ~~By-Laws/Bylaws~~; and such ~~Continuing-continuing~~ and ~~Ad-hoc~~ ~~Committees-committees~~ as the President or the Board of Directors may establish.

Article XII. PUBLICATIONS

Publication of journals ~~may~~ ~~must~~ be authorized by the Board of Directors. Other periodicals, reports, proceedings, or publications ~~may~~ ~~be~~ authorized in the ~~By-Laws/Bylaws~~, by vote of the Board of Directors, or by the Council of Chapters or the Council of Sections.

Article XIII. MEETINGS

The Association ~~shall~~ ~~must~~ hold an annual meeting of the membership ~~at a time and place in a manner~~ [designated by the Board of Directors based upon recommendation from the Committee on Meetings, unless extraordinary circumstances dictate otherwise. The decision not to hold an annual meeting would be made by the Board of Directors and announced to membership along with an explanation of the rationale for the decision.]

Commented [WR13]: To cover virtual meetings if necessary

Article XIV. AMENDMENTS

Amendments to the Constitution may be proposed by the Board of Directors or by a petition signed by at least 100 ~~not~~ ~~individual~~ members.

An amendment originating by petition ~~shall be~~ referred to the Board of Directors, which ~~shall~~ ~~must~~ vote on its recommendation regarding ratification. The Board of Directors may also decide upon the final wording of the proposed revision, as long as such wording is consistent with the original intent of the petition. Periodic revisions, as provided for in Article IX, Section 5h of the ~~By-Laws~~, ~~shall be~~ referred to the Board of Directors, which may recommend ratification as a whole or in parts.

As soon as feasible following action by the Board of Directors, the Secretary ~~shall~~ ~~must~~ publish a copy of the proposed amendment in a news bulletin. In this Constitution and the ASA Bylaws, a "news bulletin" is understood to mean a method of notification that is readily accessible and widely distributed to the membership. The published copy ~~shall~~ ~~must~~ include revisions by and recommendations of the Board of Directors and ~~shall~~ ~~invite~~ comment. Comments received ~~shall~~ ~~must~~ be summarized or published in full in subsequent issues of a news bulletin. At least 30 days

Commented [R14]: See discussion of "news bulletin" in article II of the bylaws

Constitution (6)

~~shall~~ ~~must~~ elapse between the mailing date of the news bulletin containing publication date of these comments and the vote on an amendment or revision. Regardless of the recommendation of the Board of Directors, an amendment proposed by petition must be submitted for vote. However, the Executive Committee may delay the vote to coincide with the next annual election. Ratification requires an affirmative vote of at least two-thirds of the membership. If a portion of the membership chooses not to cast ballots, that portion of the membership ~~shall be~~ counted as voting in the same proportion as that portion of the membership casting ballots.

Bylaws (1)

Bylaws of the American Statistical Association

Effective TBD

Article I. MEMBERSHIP

1. Categories. The categories of membership are the following:

~~Fellow Individual Member. A full member is an~~ ~~an~~ ~~individual~~ ~~member is a person~~ interested in the objectives of the Association or ~~an individual representing person who represents~~ an organizational member. ~~A full~~ ~~An individual member~~ enjoys all of the privileges of full membership, as provided in the Constitution and ~~By-Laws/Bylaws~~, including voting ~~for~~ and holding office. ~~Membership is contingent on paying dues~~ (see section 4 of this Article).

Commented [R1]: The reason for this change is discussed in the markup of the Constitution.

~~b. Organizational Member. An organizational member is an institution, corporation, or other organization interested in the objectives of the Association.~~

2. Membership Year. Individual membership ~~shall begin~~ ~~begins~~ with the first day of the month following the processing of the application and payment of dues and ~~shall extend~~ ~~extends~~ for twelve months from that date. Unless otherwise specified by Board action, organizational membership ~~shall begin~~ ~~begins~~ on January 1 of the year of processing of the application and ~~shall extend~~ ~~extends~~ for twelve months from that date.

Commented [R2]: Throughout the bylaws and constitution, the word "shall" appears (over 200 times total in the two documents). Unfortunately, the Supreme Court has ruled that "shall" can mean "may, will, or must," and that only "must" implies legal obligation. Therefore, we have reviewed all uses of these words in the governance documents and changed them where necessary.

3. Resignation. A member may resign from the Association by notifying the ~~Secretary/Executive Director~~. The Association ~~shall~~ ~~will~~ not refund dues under these circumstances.

Commented [WR13]: In these revised bylaws we try to use Secretary when referring to actions and activities of the Board, and Executive Director otherwise.

4. Termination. ~~Privileges of membership~~ ~~Membership~~ in the Association ~~shall~~ ~~will~~ automatically be suspended if a member has failed to pay dues within one month after the expiration of the membership year. The ~~Secretary/Executive Director~~ will reinstate such privileges and retain the original membership year if a suspended member pays his or her dues within six months after the expiration of the membership year. If in the opinion of the ~~Secretary/Executive Director~~, the defaulting member has presented a satisfactory explanation for the default, a limited extension of time ~~may~~ ~~will~~ be granted.

If a member acts in a manner detrimental to the Association, the Board of Directors ~~shall~~ ~~will~~ give notice to the member describing such charges. The member ~~shall~~ ~~will~~ then have due opportunity to respond and to have a hearing by a committee appointed by the Board of Directors. After reviewing the committee's report on the hearing, the Board of Directors may terminate membership by a vote of at least two-thirds of its members.

~~Termination of a member may also occur as a consequence of violation of the Association's conduct policy. The grounds for termination and the process by which termination would occur are specified in the Association's conduct policy.~~

Commented [R4]: Needed to reflect current ASA Activities Conduct Policy.

5. Fellows. By the honorary title of Fellow, the Association recognizes ~~full~~ ~~individual~~ members of established reputation who have made outstanding contributions in some aspect of statistical work. Fellows ~~shall be~~ ~~electe~~ ~~are~~ ~~selected~~ by vote of the Committee on Fellows.

Bylaws (2)

The number of new Fellows to be elected each year shall not exceed one-third of one percent of the individual members. Only a person who has been a full individual member of the Association for the prior three years shall be eligible for election as a Fellow.

Article II. FINANCE

1. Dues and Subscriptions. The Board of Directors shall have the responsibility of drawing up the schedule of membership dues and subscription rates. This schedule may provide different rates for certain subsets of the membership, as designated by the Board of Directors.

Any new schedule of dues and rates shall be announced in a news bulletin and shall become effective no sooner than 30 days after the mailing announcement date of the. In this paragraph and hereafter in these bylaws, a "news bulletin" is understood to mean a method of notification that is readily accessible and widely distributed to the membership.

2. Fiscal Year. The Association's fiscal year shall be the calendar year.

3. Fidelity. All persons who are responsible for the disbursement of funds shall be held as covered under a blanket Employee Dishonesty policy at limits approved by the Board of Directors.

4. Reports and Audits. The Treasurer shall submit to the Board of Directors, within 45 days of the close of each quarter of the first three quarters and within 100 days of the close of the fiscal year, the Executive Director will cause a current statement of the Association's financial condition, including assets, liabilities, income, and expenditures. This may be done at a meeting or by email. The Treasurer shall also make a financial report submitted to the Board of Directors within five months after the end of each fiscal year.

The Executive Director will also annually cause the Association's financial statements to be audited by a firm of independent public accountants selected by the Board of Directors. The report of the auditors shall be published with the Treasurer's report in a news bulletin.

5. Responsibility. The Association shall not be responsible for the debts or expenditures of any of its members or units unless such debts or expenditures are authorized by the Board of Directors or its designee.

6. Relationships. The Board of Directors may delegate to the Secretary or Treasurer or Executive Director the authority to negotiate financial arrangements with cooperating organizations in connection with publications or other joint activities, subject to approval by the Board of Directors within the limitations provided in Article IV, Section 3, Article IV, Section 3.

7. Dissolution. In the event of dissolution of the Association, the Board of Directors will, after paying or making provision for payment and discharge of all of the liabilities of the Association, distribute all of the assets of the Association exclusively for charitable, scientific, literary, and educational purposes. These assets will be distributed to such organization(s), operated exclusively for these purposes and qualifying as exempt organization(s) under Section 501 (c)(3) of the Internal Revenue Code, as the Board of

Commented [R5]: Rather than change "news bulletin" everywhere, this is added here. The meaning of "news bulletin" can change, and even the name can change. We could put "Amstat News" everywhere instead of news bulletin, but if we ever want to call Amstat News something else, or if it is replaced by something else, we would have to change the governance documents.

Commented [R6]: ASA has not operated this way in a long time, and certainly not since when these bylaws were last significantly revised.

Commented [WRL7]: There is no longer a treasurer's report that is published. We publish the annual audit. However, the treasurer's report is highlighted in the board reports in Amstat News.

Bylaws (3)

Directors shall determine. If the Board of Directors does not take such action, then the remaining property or assets shall be distributed to nonprofit charitable, scientific, literary, or educational organization(s) having power to engage in activities similar to those of the Association.

8. Indemnity. The Association shall indemnify each person who was or is a party or is threatened to be made a party to any threatened, pending, or completed action, suit, or proceeding, whether civil, criminal, administrative, or investigative, by reason of serving at the request of the Association as a director, officer, employee, or agent of another organization, against all judgments, penalties, fines, and settlements, and against all reasonable expenses, including attorneys' fees, actually incurred in connection with such action, suit, or proceeding, to the fullest extent permitted by Massachusetts law, except if the actual or potential liability is due to the person's own negligence or gross negligence, or criminal misconduct, or action in violation of ASA rules or policies.

Article III. VOTING

1. Quorum. In any mail vote of the Association's membership, all ballots received within a period set by the Board of Directors shall be counted and considered a quorum.

2. Balloting. For all of the Association's elections, the system known as approval ranked choice voting shall be used. Regardless of the number of candidates, when there are only two candidates or the number of places, ranked choice voting is equivalent to the first-the-rest-in-rank voting, so a standard plurality vote may be taken for any number of candidates but may not exceed more than one vote for a candidate. Winning candidates are those with the highest numbers of votes simpliciter. Any tie shall be broken by random selection; no runoff elections shall be held.

Ballots shall not make identify the manner by which any distinction between candidates candidate was nominated, by the Committee on Nominations, or by one of its subcommittees, or by a Council and candidates nominated, or by petition. Names of candidates shall appear on the ballot in random order.

In case of ambiguity or lack of clarity in the election rules, the Executive Committee shall determine the procedures.

Article IV. ARRANGEMENTS WITH COOPERATING ORGANIZATIONS

1. Definition. A cooperating organization is a nonprofit organization interested in the objectives of the Association and concerned with the advancement of statistical methods or their applications.

2. Procedure. The Board of Directors of the Association may enter upon cooperative arrangements with such organizations in order to promote the objectives of the Association. Such cooperative arrangements may include:

- a. The exchange of representatives, observers, or delegates to each other's governing bodies or committees;
b. The assignment of Association representatives to an organization composed of two or more

Commented [WRL9]: The ASA may very well want to take a position about ranked choice voting at some point, and so our voting should reflect this.

Commented [R10]: Improved wording

Bylaws (4)

societies, including the Association;

c. The provision of administrative, secretarial, financial, conference, publication, and other functions.

3. Limitations. The Board of Directors may not enter into any cooperative arrangement that:

- a. Results in the Association's losing its identity as an independent organization;
b. Violates any article of the Association's Constitution or By-Laws;
c. Requires the Association to allocate more than one percent of its annual revenue during any calendar year (calculated on the basis of the mean annual revenue in the three years preceding such a contemplated arrangement) without receiving the equivalent in goods or services;
d. Results in the loss of the Association's nonprofit status.

Article V. OFFICES

1. Nomination. Each year, the Committee on Nominations shall submit at least two candidates for President-Elect and at least two candidates for Vice President. The nomination process will include some means by which the Committee on Nominations ensures that the major employment sectors in which Association members work are represented over time.

For the offices of President-Elect and Vice President, suggestions for nominations will also be solicited through publication of a notice in a news bulletin.

Each year, the Council of Chapters shall designate at least two candidates for Board of Directors Representative, as provided in the charter of the Council of Chapters. The Council shall also designate nominees for such officers as its charter may specify. The election of Council officers, other than representatives for positions on the Board of Directors, may take place separately from the election for Association officers.

Each year, the Council of Sections shall designate at least two candidates for Board of Directors Representative, as provided in the charter of the Council of Sections. The Council shall also designate nominees for such officers as its charter may specify. The election of Council officers, other than representatives for positions on the Board of Directors, may take place separately from the election for Association officers.

Every third year, the Board appointed editors shall designate at least two candidates for Publication Representative who have an awareness of publication issues for Publication Representative.

The names of all candidates shall be submitted to the Secretary or Executive Director prior to the deadline established by the Board of Directors. All nominations shall and will be published in the news bulletin as soon as is feasible.

The nomination procedure for the International Representative shall be as follows:

Commented [WRL11]: The A I G rotation we use for president and vice president is not embodied in any governance document. The more broad description here would keep us from needing to revise bylaws if we want to change the rotation method.

Commented [WRL12]: Moved up from below in this section

Bylaws (5)

a. The Committee on Nominations, in consultation with the outgoing International Representative, shall appoint a three-member nominating subcommittee from among the individual members residing outside the United States.

b. The Committee on Nominations shall also solicit suggestions for nominations through publication of a notice in a news bulletin.

c. The nominating subcommittee shall submit at least two candidates for International Representative, who reside outside the United States. The candidates will be chosen to help ensure that the Board of Directors is equipped with a global perspective on the field of statistics.

These nominations shall be submitted to the Secretary or Executive Director on or before the deadline established by the Board of Directors.

Additional nominations for the offices of President-Elect, Vice President, and International Representative may be made by submitting a petition to the Secretary or Executive Director. For nominations for President-Elect or Vice President, the petition must be signed by at least 100 individual members and submitted within 45 days after the mailing date announcement of the publication announcing the candidates' names. A petition signed by at least 25 individual members residing outside the United States, submitted within 60 days after the mailing date of the publication announcing the candidates' names, is sufficient to nominate a candidate for International Representative.

Candidates for Board of Directors Representatives of a Council and Publication Representative cannot be nominated by petition.

2. Election. Each year, the Secretary shall send the Executive Director will send a ballot to all individual members, along with a brief biographical sketch of each nominee for election to the Board of Directors. This mailing shall occur early enough in the calendar year that the new officers can be selected results are known by the time of the annual meeting.

Commented [WRL14]: Moved to another section since this section deals with elected officers.

If an initial term is required for a new office, the Board of Directors shall determine the procedure for nomination and election.

3. Vacancies. Except as provided below, the Board of Directors shall fill any vacancy on the Board of Directors that occurs between elections.

Vacancies in offices of the Council of Chapters or the Council of Sections shall be filled as provided for in the charter of the appropriate Council.

If a vacancy occurs in the office of President and there is no vacancy in the office of President-Elect, then the President-Elect, if willing, shall become President for the remainder of the current term, as well as for the entirety of the succeeding term. In any other case of a vacancy in the office of President or President-Elect, the Board of Directors shall fill the vacancy by choosing one of the at-large voting members of the Board of Directors.

If a vacancy occurs in the office of Past President, the office will remain vacant for the remainder of that term, and the Executive Committee will designate board members

Bylaws (6)

to fulfill the ex officio responsibilities of the Past President.

4. ~~Duties~~ Executive Director. The Executive Director will be hired by a vote of at least two-thirds of the Board of Directors. The Executive Director is nominated by the Executive Committee per Article VII.

5. Treasurer. The Treasurer is appointed by the Board of Directors. The Treasurer is nominated by the Executive Committee per Article VII.

6. Leadership Positions. The President is the chief elected officer of the Association, serving as chair of the Board of Directors. The President is a member of the Board of Directors and shall preside at all the Executive Committee, and presides at their meetings of the Executive Committee or the Board of Directors.

Except as provided otherwise by the Constitution or ~~By-Laws~~ Bylaws, the President shall Elect will appoint the members of the committees of the Association and determine which member of each committee shall serve as its chair. (See Article IX, Section 2, Membership and Section 3, Normal Time of Appointment) will serve as its chair as indicated in Article IX, Section 2. The President-Elect may delegate appointment-making to other members of the Board of Directors.

The President-Elect shall serve as a member of the Executive Committee and of the Board of Directors and shall act as President in the event of the latter's absence or inability to serve. The Past President shall serve as a member of the Executive Committee and of the Board of Directors.

The Vice Presidents shall serve as members of the Board of Directors. They shall serve on the Leadership Support Council. ~~The From time to time, the Vice Presidents shall also be assigned to perform certain special tasks, such as chairing the Search Committee for the new Executive Director, and other special, possibly unanticipated, tasks. In the event that both the President and President-Elect are temporarily absent or unable to serve, one of the Vice Presidents, in order of seniority in that office, shall act as President. The senior Vice President serves on the Executive Committee and chairs the Budget Committee.~~

The Executive Director is the chief executive officer of the Association and will carry out the policies determined by the Board of Directors and other functions specified by the Board of Directors.

The Executive Director also serves on the Board of Directors as the Secretary and of the Treasurer shall serve Association. The Secretary serves as an ex officio member without vote of the Board of Directors and as an ex officio member without vote of the Executive Committee. The Secretary and the Treasurer shall be responsible for the duties assigned by the Constitution and ~~By-Laws~~ Bylaws and for carrying out the policies determined by the Board of Directors and such other functions as specified by the Board of Directors. The Secretary shall promptly provide each member of the Board of Directors with a copy of the minutes of each meeting of the Board of Directors. The Secretary shall prepare an annual report, for publication in a news bulletin, on the activities of the Board of Directors. The Secretary will certify to the Board of Directors the outcome of the elections for office and of any referenda.

The President and the Executive Director are the official spokespersons of the Association.

Commented [R15]: Moved from section 2 above

Commented [R16]: The ED is the CEO of ASA but is not identified that way in the governance documents. The rest of this paragraph is simply moved up from the next paragraph.

Commented [WRL17]: This edit reflects the practice of the ASA going back 20 years or so.

Bylaws (7)

When the President is unable to serve, a ~~whole~~ Secretary shall certify to the person in this order back to the Board of Directors/President-Elect.

The Treasurer is responsible for the ~~outcome~~ duties assigned by the Constitution and Bylaws. The Treasurer serves as an ex officio member of the elections for office and Board without vote and as an ex officio member of any referenda of the Executive Committee without vote.

7. Policies and Procedures Manual. A Policies and Procedures Manual for officers shall be maintained and updated on a regular basis.

Commented [R18]: The spokesperson status has been understood for many years and was spelled out at one time in operating manuals. But it has not been specified in the bylaws, and should be.

Commented [R19]: Suggested change because "presence" might be seen to imply physical presence.

Commented [WRL20]: Though we have operated on a strategic plan since 2008 we don't mention it anywhere in our governance documents.

Article VI. BOARD OF DIRECTORS

1. Members. Article VI of the Constitution specifies the composition of the Board of Directors.

2. Meetings. The Board of Directors shall meet at least three times a year. Meetings shall be held at the call of the President or of the majority of the members of the Executive Committee, or ~~by~~ by a written petition signed by at least five members of the Board of Directors. Meetings shall follow ~~Roberts'~~ Robert's Rules of Order, except where otherwise noted in the Constitution or ~~By-Laws~~ Bylaws.

3. Powers and Duties. Except as otherwise provided by the Constitution or ~~By-Laws~~ Bylaws, actions of the Board of Directors shall require the ~~presence~~ existence of a quorum and a majority of those voting. The quorum for the Board of Directors is a majority of its voting members ~~free at large members~~ as defined in Article VI, paragraph 2 of the ASA Constitution.

As the policy-making and legislative body of the Association, the Board of Directors shall make all decisions of policy. It shall adopt all rules for the conduct of its business in harmony with the Constitution and ~~By-Laws~~ Bylaws. It shall appoint representatives to cooperating and other organizations; shall ensure that a professional audit takes place annually; and shall act upon recommendations received from the Councils, the Executive Committee, and committees and upon other matters submitted to it.

The Board will maintain a strategic plan for the Association, together with a process for implementing the plan. The plan must be regularly reviewed and updated so that it remains current and relevant. The strategic plan is the Board's map for moving the Association forward. The strategic plan is also intended to guide Presidents-Elect in formulating initiatives for their presidential years.

Article VII. EXECUTIVE COMMITTEE

The Executive Committee shall have the powers responsible to nominate the Executive Director and the Treasurer, and to refer these nominations to the Board of Directors for action, and to recommend to the Board of Directors policies and actions that shall promote the welfare of the statistical profession. It shall also evaluate an annual budget and submit it for approval or modification to the Board of Directors. The Executive Committee shall discharge such other responsibilities as the Board of Directors may assign. It shall also advise the President-Elect in his position in the office of Vice President.

Bylaws (8)

The Executive Committee has the power to recommend to the Board of Directors policies and actions that promote the welfare of the statistical profession. The Executive Committee discharges such other responsibilities as the Board of Directors assigns to it.

The Executive Committee is empowered to act for the Board of Directors when action is required, a ~~majority~~ vote of the entire Board is not feasible, and, in the judgment of the President, such action is necessary. An affirmative vote of all but one of the Executive Committee members is required for ~~this process~~ such action. The Board of Directors shall be notified of such an action within seven days of such an action. This notification shall explain the urgency of the action.

The powers of the Executive Committee are limited according to Chapter 156B, Section 55 of the Massachusetts Business Corporation Law.

Article VIII. CHAPTERS AND SECTIONS AND OTHER SUBGROUPS

1. Chapters. A chapter may be established or dissolved by the procedures specified in the charter of the Council of Chapters and shall be governed by a chapter constitution that is consistent with the charter of the Council of Chapters.

2. Sections. A section may be established or dissolved by the procedures specified in the charter of the Council of Sections and shall be governed by a section charter that is consistent with the charter of the Council of Sections.

3. Subgroups other than councils, sections, chapters, and committees may also form within ASA. These subgroups must have a charter. The charter must conform to rules established by the Board of Directors. The charter must be approved by the Board of Directors. Upon approval by the Board of Directors, the subgroup will be recognized immediately as an official subgroup of ASA.

4. Student organizations, such as student chapters or clubs, may be formed subject to processes approved by the Board of Directors.

Commented [R21]: Moved up from Article XIII

Commented [R22]: Adds reference to student organizations, which didn't exist in the bylaws

Article IX. COMMITTEES

1. Types. The committees of the Association shall consist of the Executive Committee and other committees of the Board of Directors, Standing Committees and Ad hoc Committees as provided by the ~~By-Laws~~ Bylaws, and such Continuing and Ad hoc Committees as the President or the Board of Directors may establish. Continuing Committees may be established for an indefinite period of time in order to satisfy a particular need or interest of the Association. Ad hoc Committees may be established for a specified temporary period of time to carry through one project. When a new committee is established, the President or the Board of Directors shall designate it a Continuing or Ad hoc Committee. A continuing or ad hoc committee. A president may create ad hoc committees that are called by other names, such as a task force or panel, for a specified purpose related to initiatives launched by that president.

2. Committee Oversight. The Leadership Support Council (LSC) is the overarching council of the four Committee Councils: the Awards Council (chaired by the Past President) and the

Commented [WRL23]: Added more depth to the bylaws description of the LSC

Bylaws (9)

Membership Council, the Education Council, and the Professional Issues and Visibility Council (each chaired by one of the Vice Presidents). The LSC is chaired by the President-Elect, The Past President, President-Elect, and the three Vice Presidents are voting members of the LSC. Additional nonvoting members are a representative of the Program Committee and four others, each of whom is appointed by the President-Elect as a vice chair of one of the four Committee Councils.

The LSC is responsible for advising the Board about the use of committees in strategic activities that span all ASA committees or that are not directly covered by one of the four committee councils. The members of the Leadership Council have two primary tasks: 1. To assist the President-Elect with identifying candidates for committees and making appointments to committees, while recognizing that the President-Elect has the final say in making appointments. This task includes helping the President-Elect to make appointments that bring experience and diversity to committees. 2. To advise the President-Elect concerning the effective use of committees in presidential initiatives designed to meet the goals of the Strategic Plan.

Each of the Committee Councils will regularly update the Board on committee concerns and accomplishments, and make recommendations to the Board regarding the creation and timely dissolution of committees. Whenever reasonable, the President and the Board will assign tasks to existing committees rather than creating new committees.

3. Membership. The term of membership on Standing and Continuing Committees continuing committees, if not otherwise specified in these ~~By-Laws~~ Bylaws, will be three years. The term of membership for Ad hoc Committees is the life of the committee. Initial terms shall for members of a newly created standing or continuing committee will be set by the President-Elect or the Board of Directors for one, two, or three years so that, whenever possible, one-third of the members shall be appointed each year. No member shall serve on a committee for more than two consecutive years without Board approval, except for ex officio members. Members of committees shall serve until their successors are appointed or elected. Appointment to a second term is not automatic; appointments, including reappointments, are to be based on the ongoing needs of the committee, including a healthy mix of newer and experienced members.

New members of Standing and Continuing Committees are normally appointed to three-year terms by the President-Elect. In order to facilitate continuity and the orientation of new members, the President-Elect should appoint them at least six months prior to the time that they take office. If a vacancy occurs in a committee in mid-term, the President-Elect will appoint an individual to complete the term.

Each standing and continuing committee will be governed by a chair appointed by the President-Elect and a vice chair appointed by the chair, appointed by the chair. A committee chair is a member of the committee and thus holds a three-year term. When a chair's appointment is due to expire, the President-Elect shall appoint a board member designated by the President-Elect will designate a replacement to a three-year term as chair. If a chair vacates the position in mid-term, the President-Elect will appoint a replacement to serve the duration of the term. If a member of the committee resigns mid-term, another member may be assigned, possibly to a two- or four-year term if appropriate, to reestablish or maintain the usual practice of appointing one-third of the members each year.

All members of ASA committees who are appointed by the ASA must be individual

Commented [R24]: Because this is occasionally misunderstood, we have added it to the bylaws.

Commented [WRL25]: Moved from another section

Commented [WRL26]: It doesn't always work like that (3 year term for chair) and does not have to.

Bylaws (10)

members of the association during the term of their appointment. Exceptions for certain committees or committee positions can be granted by the Leadership Support Council when appropriate for the function of the committee. The Executive Committee may remove a chair or member from a committee.

Normal Time of Appointment. In order that new members of Standing and Continuing Committees may begin work promptly, the President-Elect shall normally designate these members for three-year terms. If possible, this shall be done at least six months prior to the time the new committee members take office. If a vacancy occurs in a committee in mid-term, the President shall appoint an individual to complete the term.

4. Appointment Process. The President-Elect will appoint the members and chairs of ASA committees as well as ASA representatives to other organizations, except as noted in the bylaws. The President-Elect may delegate to other members of the board the making of appointments. The Leadership Support Council will assist the President-Elect with the process of making appointments by consulting with committee chairs, assembling recommendations from the chairs and others, and providing the President-Elect with recommendations and information regarding the needs of committees.

4.5. Committees of the Board of Directors. The committees of the Board of Directors are listed next.

a. Audit Committee. The Audit Committee shall consist of the Treasurer, who acts as chair, the chair of the Budget Committee, and the Past President. It shall periodically recommend an audit firm to the Board of Directors; serve as the Board of Directors' liaison to the Association's auditors; represent the Board of Directors in discharging its responsibilities relating to the accounting, reporting, and financial practices of the ASA; have general responsibility for surveillance of internal controls, accounting, and audit activities of the ASA; ensure the audit is carried out in a fiscally sound manner; review audit procedures with the audit firm; their audit procedures, including the scope and timing of the audit, the results of the annual audit, and any accompanying management letters; assess the adequacy of internal controls and risk management systems; review the IRS Form 990, 990-T, and Virginia Form 500; review the document destruction and whistleblower policies; and review material about any pending legal proceedings involving the ASA.

b. Budget Committee. The Budget Committee shall consist of the three Vice Presidents and Treasurer. The Treasurer is an ex officio member without vote. The senior Vice President shall serve as chair of the committee. The Committee shall annually recommend the operating budget for the coming fiscal year, including the association staff compensation budget (salaries and fringe benefits) for the ASA staff, for action by the Board of Directors; periodically review the Association's financial results in comparison to the budget, and periodically assess the facilities needed by the headquarters of the Association.

c. Executive Committee. The Executive Committee shall be constituted as described in Article VII of the Constitution.

d. Management Review Committee. The Management Review Committee consists of the President, who acts as chair, the President-Elect, and the Past President. It is responsible for the performance review, performance evaluation, and compensation of the Executive Director. It is responsible for creating the contractual agreement between

Commented [R27]: Codifies the process we have been using for several years

Commented [R32]: Rewritten for clarity. No change to the actual role of this committee.

Commented [WRL33]: Note that this is an exception to the general rule that Presidents-Elect make committee appointments.

Bylaws (11)

the Association and a new Executive Director

e. Strategic Plan Review Committee. All third-year members of the Board, the ASA treasurer, the Publications Representative, and the Executive Director, comprise the Board Strategic Plan Review Committee. The Past President will serve as chair. The committee reviews progress made on the strategic plan, and when necessary makes recommendations for minor modifications to the plan to the Board of Directors. The committee will make a report to the Board of Directors at the final Board meeting of the year. The committee is responsible to inform the Board when it is time to appoint a Strategic Planning Committee and launch a new strategic planning process.

7. Standing Committees. The Standing Committees are listed next. Each committee shall, with support from ASA staff, maintain and periodically update a procedures manual.

Leadership Support Council. The Leadership Support Council shall consist of at least five members appointed by the President. In addition, the President-Elect, the Past President, and the Vice Presidents are ex officio, voting members of the Leadership Support Council. The President-Elect shall serve as chair. The Leadership Support Council advises the Board on the effective use of committees in the strategic activities of the Association.

b. JSM Program Committee. The JSM Program Committee ("the Program Committee") for a given year shall be responsible for planning the technical content of the annual meeting of the Association in that year. Considered by the committee nominees suggested by the JSM Committee at its meetings, the candidates for newly elected President-Elect shall be selected as soon as possible after the election select the chair of the Program Committee, approximately two years prior to the meeting, for the year in which the newly elected President-Elect will be President.

The Program Committee will consist of representatives for chapters, sections, and committees who are designated as follows: the Council of Chapters shall designate a Chapter Program Chair, and each section of the Association shall designate a Section Program Chair. The Leadership Support Council will designate one of its appointed members to represent committees. The Chapter Program Chair and each Section Program Chair shall be a member of the Program Committee and shall be invited to attend the initial meeting of the Program Committee. Invitation to subsequent meetings shall be at the discretion of the Program Committee Chair, who shall retain final responsibility for organizing the program of the annual meeting.

The Program Committee also has members appointed by JSM partner societies to represent those societies.

c. JSM Policy Committee. Each year, the JSM (Joint Statistical Meetings) Policy Committee consists of the chairs of the JSM Program Committees for that year, the prior year, and the coming year and three other ASA members who are appointed. The Committee also includes as members a representative designated by each of the other founding JSM partner societies to serve a three-year term. All members of the Committee have voting rights on all JSM issues. The chair is chosen from all members of the Committee have voting rights on all JSM issues

Commented [R28]: This is and has been the practice, but was not in the bylaws

Commented [WRL29]: Not a new committee, but previously not described in the bylaws

Commented [R30]: The changes in section b describe what our practice is; no changes to existing practice or procedure here

Commented [R31]: Name change to reflect the actual role of this committee

Bylaws (12)

Committee on Publications. The duties of the JSM Policy Committee shall consist of:

- (1) Recommending general policy for all meetings, including annual meetings, subject to approval by the Board of Directors;
(2) Planning for annual meetings and providing for continuity in practices and programs of the annual meetings;
(3) Fostering innovation in annual meetings and evaluating the results of such innovation;
(4) Fostering regional meetings, including those of chapters and sections, which may be cosponsored with other organizations.

d. Investments Committee. The Investments Committee shall recommend to the Board of Directors investment guidelines that will improve the safety, return, reporting, and management of the Association's investment accounts. The Investments Committee also assesses adherence to investment guidelines; periodically reviews the holdings in the investment accounts; evaluates the performance of the investment managers and consultants; recommend to the Board of Directors, as appropriate, steps that will improve the safety, return, reporting, and management of the investment accounts; and such other matters carries out tasks related to the financial performance of the Association as that the Board may assign from time to time. The Investments Committee shall consist of the Treasurer as chair and six members, each serving a three-year term, designated term, who are appointed by the President-Elect.

e. Committee on Nominations. The Committee on Nominations shall consist of six individual members of the Association, each serving a two-year term. Each year, with the consent of the Board of Directors, one member shall be appointed by the President-Elect, one member shall be appointed by the Council of Chapters, and one member shall be appointed by the Council of Sections. The Committee shall make nominations for offices provided in Article V, Section 1, Article V, Section 1. Nominees may serve on the Committee for two full terms in succession or be a current member of the Board of Directors. Members of the Committee shall not be eligible for nomination by the Committee.

f. Committee on Fellows. The Committee on Fellows shall consist of nine Fellows, three of whom shall be designated and appointed by the President-Elect for a term of three years. No Fellow may serve on the Committee for more than one full term. A member of the Committee with longest continuous service shall serve on the Committee and be designated as chair for a one-year term by the President-Elect. The Committee shall select Fellows in accordance with Article 1, Section 5, Article 1, Section 5.

g. Committee on Publications. The Committee on Publications shall be constituted as described in Article X, Article X.

h. Constitution Committee. At least once every eight years, the President will appoint a Constitution Committee for

Commented [R32]: Rewritten for clarity. No change to the actual role of this committee.

Commented [WRL33]: Note that this is an exception to the general rule that Presidents-Elect make committee appointments.

Bylaws (13)

the purpose of reviewing the Association's Constitution and By-Laws and recommending revisions.

e. Development Committee. The Development Committee consists of six members, two of whom are appointed/reappointed each year by the President-Elect for three-year terms. One member is also appointed when necessary. The Committee shall prepare a revision to be submitted to the membership not more than ten years after the adoption of this Constitution, in accordance with provisions by the President-Elect to serve as the Chair. The ASA Treasurer also serves as an ex-officio member. The committee promotes and enhances the educational, scientific, and exceptions of Article XIV of the Constitution. In the event that the Constitution Committee undertakes a major revision of the Constitution, the goals of the ASA by planning and By-Laws, the Board of Directors may extend the life of the current Constitution, and By-Laws for one year at a time, overseeing a development program.

8. Continuing Committees. The life of a Continuing Committee may not exceed committees should be reviewed at least every seven years without a review for its to determine whether there is a continuing need for the Board of Directors committee. Any committee that is to continue for more than one year must have a charge approved by the Board of Directors. Committee charges will be regularly reviewed by committee chairs and the Leadership Support Council to ensure that work done by committees continues to serve relevant goals of the Association.

Continuing Committees established in accordance with this article may be dissolved at any time by majority vote of the Board of Directors.

9. Ad hoc Committees. The life of an Ad hoc Committee may not exceed one year without a review for its need by the Board of Directors.

Ad hoc Committees established in accordance with this article may be dissolved at any time by majority vote of the Board of Directors.

Article X. PUBLICATIONS

1. Editor. Candidates for editors for ASA-owned journals shall be selected from the members of the Association and appointed by the Board of Directors. The Board of Directors shall fix a term of office of five years or less for each editor, with appointments typically for three years. Editors of chapters, sections or subsection publications shall be selected according to guidelines in the charter of the appropriate Council.

2. Editorial Boards. Each journal or professional publication published by the Association shall have an editorial board, consisting of all its associate editors and such other personnel as each editor may designate.

3. Committee on Publications. The Committee on Publications shall consist of one representative from each of the publications that are owned by the ASA, three at-large members, and the Publications Representative from the ASA Board.

The representatives from the jointly owned publications that have a management committee will be the chairs of these committees. Representatives

Commented [WRL34]: Not a new committee, but previously not described in the bylaws

Commented [R35]: Codifies existing practice as described in the LSC manual

Commented [WRL36]: Changes to this section clarify practice. No changes to actual organization or responsibilities.

Bylaws (14)

Bylaws (15)

from the ~~other~~ ASA-owned publications are to be selected by their respective editorial boards, subject to the approval of the ASA President-Elect, for a term of at most three years. The at-large members will be appointed by the President-Elect—~~These~~ their terms will be three years—~~They, and they~~ should be appointed so that one member cycles off the committee each year. When needed, the President-Elect ~~shall~~ will designate one at-large member as chair of the Committee on Publications. A chair of the Publications Committee ~~may~~ will serve as chair for no more than three years.

Proposals for the publication of periodicals, and other publications requiring Board review, ~~shall~~ will be referred to the Committee for its recommendations, prior to action by the Board of Directors. The Committee ~~shall~~ oversees the publication policy of the Association and make recommendations to the Board of Directors.

~~The Committee will also address charges of publications misconduct, making recommendations to the Board of Directors when needed~~

Commented [R37]: Unfortunately, such misconduct occurs, and when it does it has fallen in the lap of the CoP. We should spell this out in the bylaws.

Article XI. RESOLUTIONS

1. Partisan Issues. The name of the Association ~~shall~~ must not be used in connection with support for partisan issues or for candidates for public office. Resolutions by the Board of Directors on non- partisan issues ~~shall~~ require approval by two-thirds of the voting members of the Board ~~who are not required to recuse themselves due their government employment or a conflict of interest~~. When there is concern as to whether an issue is partisan, a majority vote of the voting members of the Board is required to declare it non-partisan.

Commented [WR138]: Without this change, it is possible to not have enough board members to be able to pass a resolution even when it is unanimous among those who can vote. As written, if the board had five government employees, it could not make any statement regarding the government, because 10 votes are required absent this proposed clause.

2. Referenda. Upon petition of at least 100 ~~full~~ individual members of the Association, any resolution of the Board of Directors, as specified in ~~Article XI, Section 1, shall~~ Article XI, Section 1, will be subject to a referendum by the membership. The resolution ~~shall~~ will be published in a news bulletin as early as possible. A ballot ~~shall~~ will be ~~mailed~~ sent to the ~~full~~ individual members within 30 days after the ~~mailing~~ publication date of the news bulletin. The will of the membership, as expressed by a majority of those voting, ~~shall~~ govern.

3. Commitment. Resolutions and recommendations of councils, chapters, sections, or committees of the Association ~~shall~~ will be so phrased as not to commit the Association or its membership.

Article XII. AMENDMENTS

1. Proposal. Amendments to the ~~By-Laws~~ Bylaws may be proposed by the Board of Directors, by a petition signed by at least 25 ~~full~~ individual members, or by majority vote of either the Council of Chapters or the Council of Sections. An amendment originating by petition or in either Council ~~shall~~ will be referred to the Board of Directors for a vote on its recommendation as to ratification.

2. Ratification. The Secretary will publish ~~as soon as possible~~ a copy of the proposed amendment, together with the recommendation of the Board of Directors, in the news bulletin, inviting comment. The Board of Directors will vote on the amendment after 75 days elapse from the publication date of the publication. The amendment will be submitted to the individual members for a vote if during this period 50 individual members of the Association so petition. These 50 individual members must represent at least

five chapters and five sections.

If such a demand for a membership ballot is received, at least a two-thirds affirmative vote of the individual members voting is required for ratification. If no such demand is received, the amendment may be ratified or rejected by the Board of Directors. Ratification will occur whenever at least two-thirds of the members of the Board of Directors have submitted an affirmative vote. If the action taken by the Board of Directors differs from its original recommendation, the ratification process must be repeated with the new recommendation.

Commented [WR139]: Moved to article VIII, section 3

Department of Statistics at Mason Welcomes Prof. Jiayang Sun



Jiayang Sun

The Department of Statistics at George Mason University, housed within the Volgenau School of Engineering announces the appointment of Prof. Jiayang Sun, formerly from Case Western Reserve University and currently serving as an inaugural ASA/ACM/AMS/IMS/MAA/SIAM Science & Technology Policy Fellow at the U.S. Department of Agriculture, as Bernard J. Dunn Eminent Scholar and Chair. Prof. Sun, who graduated from Stanford University, has a significant research portfolio in a variety of theoretical, applied, and computational problems. Her work has appeared in top-tier statistics and probability journals and scientific journals.

The department has 20 faculty, including influential educators and researchers working in impactful areas at the intersection of statistics, probability, computer science, medicine, and healthcare. The department offers B.S., M.S., and Ph.D. degrees in Statistics and an M.S. in Biostatistics.

The faculty and staff welcome Jiayang Sun and are looking forward to working with her to grow the department further.

Light Sabers, Dr. Pepper, and More

Amanda Malloy, ASA Director of Development



Malloy

I am the ASA's director of development, but thanks to COVID-19, I'm now a schoolteacher, lunch lady, and CEO (chief entertainment officer) to my two kids who are also stuck at home. I never thought I would have to apologize for my three-year-old interrupting a video meeting with no pants on #pottytrainingduringCOVID. I'm in a constant search for activities to keep them busy and their brains from rotting.

When I asked my 8-year-old, Drew, if he would like to enter the ASA Virtual Science Fair, he immediately said, "YES!" When I asked what science experiment he wanted to do, he responded, "I want to build different light sabers and see which one works the best."

After I explained we didn't have the necessary resources to do that (i.e., George Lucas), he was less than enthused. But when I told him he could win a cool prize and maybe even a gift card, he was motivated once again. The next hurdle to overcome was deciding what burning question he had that could be answered by an "earthly" science experiment we could actually pull off. Drew liked none of my ideas and was having trouble thinking of one of his own. That's when I decided to call in the "big guns."

Thankfully, the ASA GivesBack group—whose purpose is to promote a culture of philanthropy at the ASA—organized a group of ASA members who volunteered to be mentors for science fair participants.

Drew was paired with Eric Wilken, a graduate student instructor at Ball State University. Drew sent Eric a list of his interests, which included Star Wars, toxic chemicals, airplanes, and Nerf guns. From that list, Eric came prepared to the first Zoom call with lots of ideas to help Drew come up with an experiment.

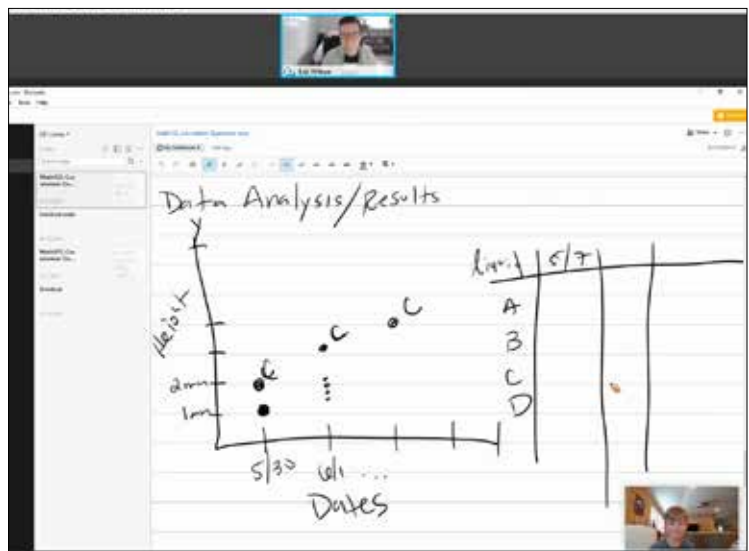
Surprising to me, Drew decided to do a study that would determine what liquids plants grow best in (and which are toxic). Spoiler alert: Don't water your plants with Dr. Pepper.

It was a wonderful experience for Drew, and he is already thinking about what to do next. Success!

I shared this story with you because it is a great example of what the ASA is doing to inspire kids and improve statistics education by providing innovative resources to educators (teachers and parents). It's also a fantastic example of the kind of activity the ASA GivesBack group is focused on and how quickly ASA members step up to help.



Drew, 8, sent his online Virtual Science Fair mentor a list of interests, which included Star Wars, toxic chemicals, airplanes, and Nerf guns.



Drew was paired with a fabulous mentor, Eric Wilken, who is a graduate student instructor at Ball State University. Here, Eric shares some ideas to help Drew come up with an experiment.

Since ASA Giving Day is coming up next month (and I'm still the ASA director of development), I also shared this story as an example of the impact you make by giving—giving of your time and/or giving financially. This year on Giving Day, we are showcasing all the ways you can give—donate, volunteer, and share a message of hope and encouragement with your fellow ASA members. Who couldn't use a message of hope and encouragement right now?

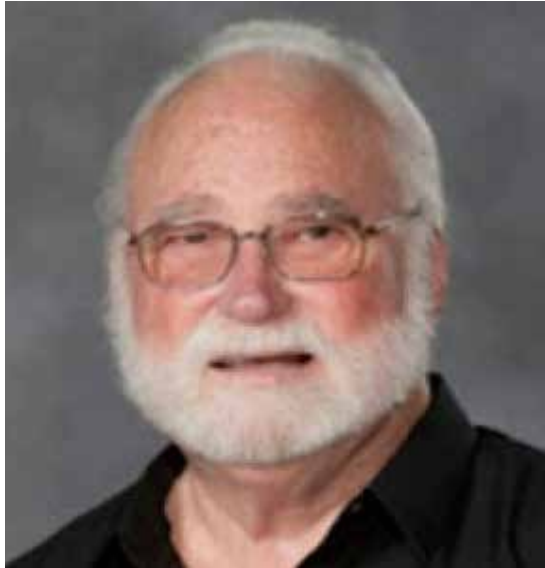
Visit www.amstat.org/givingday to learn more. We like to have a little fun, too, so be sure to check out all the ways you can win a cool prize on Giving Day and participate in the Chapter Challenge and University Challenge.

May the Force be with you! ■

MORE ONLINE
For more information about the ASA GivesBack community, visit www.facebook.com/asagivesback2020.

Karl E. Peace: A True Humanitarian

Coleman Harris



Karl E. Peace embodies the humanitarian spirit of “Data for Good,” citing adversities in his life as opportunities to push his career to greater heights. He grew up as a member of a sharecropping family in Southwest Georgia, to parents with fewer than five years of schooling between them. Building on an acumen for mathematics and encouragement from his mother, he sought to attend college after graduating high school.

Not having any money of his own, Peace borrowed \$532 for two quarters of tuition, room, and board at Georgia Southern College. He then combined income from seven part-time jobs and a Georgia State Teacher’s scholarship to finish his undergraduate degree in chemistry, while supporting his mother and younger siblings.

Peace went on to pursue a master’s degree in mathematics at Clemson University, before returning to Georgia Southern to teach. Gaining significant interest in statistics, he taught full time at Randolph-Macon College while pursuing a PhD in biostatistics from the Medical College of Virginia.

Peace began his career in the pharmaceutical industry at Burroughs-Wellcome as an entry-level statistician. He then joined A.H. Robins as the manager of clinical statistics and, nearly two years later, became director of research statistics at SmithKline and French Labs.

In 1986, Peace accepted a position as the senior director of gastrointestinal clinical studies and clinical operations at G.D. Searle. There, he was responsible for functions such as biostatistics and clinical

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Life is to give, not to take.

— Jean Valjean

trial management. He also ran the clinical development program for Cytotec, the first FDA-approved drug for preventing NSAID-induced gastric ulcers.

Just two years later, Peace became the vice president of WW Technical Operations at Parke-Davis/Warner Lambert. Ten short years after his start as an entry-level statistician, Peace had climbed the leadership ranks of the pharmaceutical industry. This provided the opportunity for him to contribute to the approval of many drugs across treatment classes.

Peace then started his own contract research organization (CRO) in 1989—Biopharmaceutical Research Consultants (BRCI). The venture proved successful, providing research and development consultation to more than 50 companies in the pharmaceutical and biotechnology space.

Discouraged by the lack of public health programs in his home state, Peace left BRCI to lay the groundwork for the first college of public health in the University System of Georgia. He endowed the Jiann-Ping Hsu College of Public Health, named for his late wife, and continues to promote and help maintain the program at Georgia Southern. This includes establishing the MPH in biostatistics and founding the Karl E. Peace Center for Biostatistics.

Peace’s contributions do not stop there. He pursues philanthropic causes, including nearly two dozen endowments and numerous contributions to local organizations in Georgia. He also founded two capstones of the biopharmaceutical statistics field, the *Journal of Biopharmaceutical Statistics* and the Biopharmaceutical Applied Statistics Symposium.

Peace’s career culminates in more than 50 awards and honors that detail his commitment to excellence, philanthropy, and Data for Good. A true humanitarian, he personifies one of his favorite quotes from Victor Hugo’s *Les Misérables*: “Life is to give, not to take.” — Jean Valjean

Q&A with Karl E. Peace

What attracted you to statistics? Why this field?

The two-semester sequence, Introduction to Probability and Statistics, during my master's degree in mathematics at Clemson was the first time I studied probability or statistics. I had a more natural affinity to probability and statistics than I did for other math courses.

Later, while completing my PhD in biostatistics at the Medical College of Virginia, I had the opportunity to consult with physicians engaged in interesting research and pharmaceutical industry statisticians. This showed me the good that biostatisticians can achieve by working in the pharmaceutical industry, collaborating with clinical scientists and physicians.

What does 'Data for Good' mean to you?

It can mean different things to different people, and perhaps implies that there is some data that is not used for good. I like the definition from Gartner: **Data for good** is "a movement in which people and organizations transcend organizational boundaries to use **data** to improve society." I think this most closely parallels my efforts for good over the years.

What recommendations do you have for researchers interested in working in this area?

My advice is to learn as much as you can about statistical theory and applications and become as proficient as possible in statistical analysis software—particularly SAS and R. Realize that what you know at one point in time is just a snapshot of what you'll need to know in the future to become and continue to be an expert statistician; learning is lifelong.

Review the accomplishments, advice, and philosophies of great statisticians (e.g., Chin-Long Chang, Marvin Zelen, Richard Simon, Gary Koch). To be successful, a statistician must convey to clients that they truly want to help solve real-world problems. They must develop critical thinking skills and communicate statistical concepts and methods to nonstatisticians in words, not formulae!

Don Berry's article in *Amstat News* (<https://magazine.amstat.org/blog/2012/02/01/collaborationpolice>) also provides excellent advice for statisticians of all ages.

Do you have any advice for students interested in pursuing careers in the Data for Good space?

Follow what makes you feel good, if the financial remuneration allows you to continue to do those things. So, I'd say follow your dream. As someone once said, "If you do as a professional what you love doing, you'll never have to work a day in your life."



2014—Karl Peace (left) accepts the Sellers-McCroan Award, presented by Wade Sellers [photo courtesy of Ginger Heidel at HeidelDesign].

What makes a good statistician?

The ability to think logically; fidelity to the scientific method; the desire to solve problems and help clients; good listening, communication, and presentation skills; thirst for quality; attention to detail; and knowledge of statistics and computational software packages such as SAS and R.

Your work has crossed boundaries of academia and industry. Is one medium better than another for Data for Good? Are their concessions to each that balance out?

It depends on the individual. From observation, I think there are more differences than similarities. Statisticians in industry provide at least a full day of quality productivity every day of the week, with little time to engage in 'water fountain' gossip. In contrast, many academicians may have too much time on their hands. Two superb academic biostatisticians who come to mind are the late Marvin Zelen and Gary Koch. Both were/are outstanding teachers who combine theory with their own practical experience gained from the industry. So, the best teachers of biostatistics are those who have direct experience in the design, conduct, analysis, and interpretation of real-world experiments and who learned to deal with the myriad logistical problems that arise.

Many doctoral graduates in biostatistics elect to pursue an academic teaching position, while others pursue a career in industry. I would advise biostatistics students to search their heart and soul honestly. If you have a passion for teaching students, then a position in academia is relevant. However, if your passion is solving real-world problems, then industry might be a better career fit. ■

Kristian Lum: A Statistician Inspired by Human Rights

Coleman Harris



Find what you're passionate about and exactly what good in the world you want to do.



Building on an interest in mathematics while in high school, Kristian Lum went into college set on a math degree. However, what she expected was a connection between the problems and reality—something she didn't find in higher mathematics. It wasn't until she took a course in statistics that she really discovered her passion because she could use quantitative skills to tackle real-world problems.

In her last year at Rice University, Lum participated in a Research Experience for Undergraduates (REU) with one of her professors, who encouraged her to pursue a PhD. That push was what she needed to begin a PhD in statistical sciences at Duke University, again working on a real-world problem: Bayesian spatial quantile regression.

Lum pursued a short postdoctoral position in Rio de Janeiro, Brazil, after her doctoral work and before taking some time off. She then joined the Virginia Bioinformatics Institute at Virginia Tech, where her research focused on microsimulations and computational epidemiology, social contagion, and disaster planning.

Lum left Virginia Tech to join the startup DataPad, founded by Python pandas creator Wes McKinney, where her work centered on customer-facing data science. After DataPad, she spent time as a consultant in the data science space and developed a part-time relationship with the Human Rights Data Analysis Group (HRDAG). However, from 2015 to early 2020, Lum was the lead statistician in a full-time role with HRDAG, where she led the group's project on criminal justice in the United States. Her body of work includes research on algorithmic fairness and predictive policing, collectively using a variety of methods to understand the criminal justice system.

Lum joined the University of Pennsylvania CIS Department in March 2020 as a research assistant professor, including ties to UPenn's Algowatch Initiative and the Warren Center for Network and Data Science.

Across myriad positions, Lum has explored the topics of justice, fairness, and transparency from a statistical perspective. This humanitarian approach to data science addresses the needs of many marginalized populations and embodies the ideal of Data for Good. You can find Lum on Twitter @KLdivergence.

Q&A with Kristian Lum

Why did you pursue a PhD?

To be honest, I knew I was good at school and it was more school. It wasn't a specific plan, like someday I want a PhD in statistics or I want to be a professor. I wish I could say there was more of a master plan behind it, but it was just the natural next thing for me to take on.

I actually recommend for people to get real-world context by taking some time between undergraduate and graduate school. I think it's important and helps to motivate the problems you can work on in grad school. People I know who did this ended up with a more rewarding graduate career, because of that added direction and experience.

What inspired you to pursue a career in the Data for Good space?

About halfway through graduate school, I wanted to make sure the topics I was pursuing were tied to reality. My dissertation was on Bayesian spatial quantile regression, which is very tied to reality, but I wanted to do something with more impact.

I cold emailed Patrick Ball, a founder of HRDAG and now a longtime mentor, with some ways I could help out. To my surprise, he responded that the ideas were great and invited me on a data collection trip to Colombia. That's what kicked off my interest, another one of those small things that ended up having a big impact. And ever since then, I've stayed in the Data for Good space with HRDAG, either part-time or as a full-time statistician, doing stats through the lens of human rights.

What recommendations do you have to researchers interested in working in this area?

Find what you're passionate about and exactly what good in the world you want to do. Try to connect with organizations that are already doing that good, because they know more about the issues you care about, and see if there are any projects to get involved with. Essentially, find a way to become involved in the areas you're interested in, including support for the groups already working toward those goals.

What does 'Data for Good' mean to you?

I think the term "Data for Good" is too broad, because good is in the eye of the beholder. For example, the criminal justice area includes different ideas about what good is, depending on the perspective. I don't think there's this one "good," rather it's dependent on the perspective.

Usually, when I describe myself, I describe the areas I work in rather than Data for Good. I work in fairness, particularly in criminal justice, or I mention my work on casualty estimation (the number of people killed in various conflicts around the world). And those could be described as Data for Good, but I personally tend to describe the topic area I work in instead.

What is the most defining experience that has shaped your career?

My first summer working with HRDAG, I was working on casualty estimate—estimating the number of people who have been killed in Colombia. Until that point, I wanted to do something with impact, but, operationally, the work wasn't that different from other statistics projects I've done. When we went to Colombia, I remember we stopped to speak with someone doing data collection on the ground. This woman worked at a small, somewhat rural cemetery and took names of the deceased and registered bodies that turned up without names.

It was an impactful experience to see where the data actually came from. I'm glad we didn't see a body that day, since people often dropped them off there. The experience did, however, make the data feel so much more real and my projects more real. And our work couldn't tell you who those people were, but at least it sort of told us the magnitude of the problem and the conflict there.

What advice do you have for people who might want to take a career path similar to yours?

Follow your interests. If there's something you're excited about, go with it, because you're going to have more motivation to work on something that makes you want to throw yourself in it. I know it is a privilege to be able to follow your interests. But following them to the extent that you can defines how I've moved through my career so far.

If you do want to have a winding path type of career, you can't really be worried about accolades in career progress. When you do multiple career switches, you kind of start over each time. Sometimes, it's frustrating when you see peers get promoted or receive awards, but that happens a bit less when you're jumping from thing to thing.

What makes a good statistician?

Someone who genuinely cares about learning about the real world. And a willingness to really get dirty with the data, to interrogate where the data comes from and what biases could have generated it. ■

MORE ONLINE
Follow Lum on Twitter
[@KLdivergence](#).

C. R. Rao's Foundational Contributions to Statistics: In Celebration of His Centennial Year

B.L.S. Prakasa Rao, C. R. Rao Advanced Institute of Mathematics, Statistics, and Computer Science; Randy Carter, University at Buffalo; Frank Nielsen, Sony Computer Science Laboratories, Inc.; Alan Agresti, University of Florida; Aman Ullah, University of California, Riverside; and T.J. Rao, Indian Statistical Institute



C.R. Rao, painted by Mihira Karra in celebration of his birth centenary

Calyampudi Radhakrishna Rao was born on September 10, 1920, in Hadagali, which is in the current State of Karnataka, India. He grew up with six brothers and four sisters in a comfortable family environment created by his mother, A. Laxmikanthamma, and father, C.D. Naidu.

A Chance Introduction to His Last Resort

It seems ironically appropriate that a living legend of statistics would enter the discipline by chance. That was the way it happened for C.R. Rao. He completed work for an MA in mathematics at Andhra University in 1940 at age 19. He then wanted to pursue a career in mathematics, but his application for a research scholarship was rejected on the grounds that it was received after the deadline. So, he applied for

a job as a mathematician for the army survey unit during World War II. Rao went to Calcutta for an interview, but the job eluded him. By chance, he met a man in Calcutta who was taking a training course at the Indian Statistical Institute (ISI), which was founded in 1931 by P.C. Mahalanobis but was unknown to Rao. He applied for admission to the one-year training program in statistics hoping the additional qualifications would land him a job in the future. It was a last resort for Rao that turned into a godsend for Mahalanobis, who promptly accepted the application, thus launching Rao on his life's work.

Design of Experiments

Rao entered the training program at ISI in January of 1941 but left it in mid-course to join the newly formed master's program in statistics at Calcutta University. He graduated with an MA in 1943. Now, with two master's degrees, he was given the position of research scholar at ISI and a part-time job at Calcutta University to teach a course in statistics, a position he held until 1946.

During his master's studies, Rao published nine papers: eight on experimental design, six as co-author with K.R. Nair, and two independently. Over the next two years, he co-authored four mathematics papers with R.C. Bose and S. Chowla on combinatorics, group theory, and number theory, gaining mathematical knowledge that complemented his expertise in experimental design.

With this combined knowledge base, Rao developed the theory and application of orthogonal arrays. He introduced the concept in his master's thesis and developed it in two 1946 papers: "Difference Sets and Combinatorial Arrangements Derivable from Finite Geometries" in the *Proceedings of the National Institute of Science* and "Hypercubes of Strength 'd' Leading to Confounded Designs in Factorial Experiments" in the *Bulletin of the Calcutta Mathematical Society*. This line of research culminated in the general definition and presentation of the application and theory of orthogonal arrays in papers in 1947 and 1949: "Factorial Experiments Derivable from Combinatorial Arrangements of Arrays" in *Journal of the Royal Statistical Society* and "On a Class of Arrangements" in *Proceedings of Edinburgh*. The profound importance of this work is noted in the preface of the *Orthogonal Arrays: Theory and Applications*, published by Springer-Verlag in 1999.

Orthogonal arrays are beautiful and useful. They are essential in statistics and they are used in computer science and cryptography. In statistics, they are primarily used in designing experiments, which simply means they are immensely important in all areas of human investigation.

- A.S. Hedayat, N.J.A. Sloane, and J. Stufken

MORE ONLINE
This article draws from a 2014 piece by B.L.S. Prakasa Rao, "C.R. Rao: A Life in Statistics," for the series Living Legends in Indian Science published in *Current Science*.
Read that article at <https://bit.ly/2D9r4dH>.

A Most Remarkable Paper

Rao's truly remarkable *Bulletin of the Calcutta Mathematical Society* 1945 paper, "Information and Accuracy Attainable in the Estimation of Statistical Parameters," made two foundational contributions to statistical estimation theory and broke ground on the geometrization of statistics, which later provided a cornerstone of the interdisciplinary field of information geometry. The paper was included in the book *Breakthroughs in Statistics Vol. 1, 1890–1990*.

Estimation Theory

The paper opened new areas of research on estimation theory and produced two important results bearing Rao's name: the Cramér-Rao inequality and Rao-Blackwell theorem, which gave rise to the term Rao-Blackwellization. These results were foundational breakthroughs and are included in virtually all textbooks on mathematical statistics.

The results had a profound effect on other disciplines, as well. For example, in his 1998 book *Physics from Fisher Information: A Unification*, B. Roy Frieden writes, "The Heisenberg Uncertainty Principle is an expression of the Cramér-Rao Inequality of classical measurement theory, as applied to position determination." Quantum physicists derived what is called the Quantum Cramér-Rao Bound (1998), which provides a sharper version of the Heisenberg Principle of Uncertainty. Rao-Blackwellization improves the efficiency of an unbiased estimator when a sufficient statistic exists.

Results obtained by other authors based on Rao's 1945 paper and named after Rao are Global (Bayesian) Cramér-Rao Bound (1968), Complexified and Intrinsic Cramér-Rao Bound (2005), Rao-Blackwellized Particle Filters (1996), Stereological

[H]e is a living legend whose work has influenced not just statistics but has had far reaching implications for fields as varied as economics, genetics, anthropology, geology, national planning, demography, biometry, and medicine.

- Statisticians in History, *Amstat News*, 2002

Rao-Blackwell Theorem (1995), Rao-Blackwell versions of cross validation and nonparametric bootstrapping (2004), and Rao Functionals (1988).

Rao-Blackwellization now plays an important role in computational statistics, with recent major developments in stochastic simulation methods such as Markov Chain Monte Carlo.

Geometrization of Statistics

In the same 1945 paper, Rao proposed a differential geometric foundation for statistics by introducing a quadratic differential metric in the space of probability measures. Historically, Rao was working in 1943 at the ISI under the guidance of P. C. Mahalanobis, who asked him to perform cluster analysis of several castes and tribes based on anthropometric measurements of individuals. Mahalanobis initially suggested the use of his D-squared distance, but this work motivated Rao to investigate more general notions of distance. He introduced Riemannian differential geometry for modeling the space of probability distributions using Fisher information as a Riemannian metric—the so-called Fisher-Rao metric. The induced geodesic distance

between two probability distributions yielded a distance metric called Rao's distance. This work has become one of the most active and important topics in information science over the last 25 years, connecting statistics, information theory, control theory, and statistical physics. It is fundamental to the multidisciplinary field of information geometry, which is increasingly important in information sciences, machine learning, and AI.

For more about Rao's 1945 paper, read the chapter by P.K. Pathak introducing it and a reproduction of the original article, both in *Breakthroughs in Statistics, Vol. 1*.

The Score Test

Rao has done much to advance knowledge in theory and practice of statistical inference. His book *Linear Statistical Inference and Its Applications* has been cited nearly 17,000 times. His most acclaimed single piece of work in this area, however, is what is now known as Rao's score test.

During his time as a research scholar at ISI, Rao was approached by a scientist named S.J. Poti, who asked for help in testing a one-sided alternative hypothesis ($\theta > \theta_0$). Rao set to work to develop a test that was

Deeper Dive

For broader coverage of Rao's life and his many academic accomplishments and honors, visit the following webpages:

C.R. Rao Advanced Institute of Mathematics, Statistics, and Computer Science (AIMSCS), <https://crraoaims.in/about-crrao>

"About C.R. Rao," by Marianna Bolla, <http://mathematics.ceu.edu/rao>

CRR – A Day in Honor of Prof. C.R. Rao, <https://bit.ly/2XQXKQB>

Calyampudi Radhakrishna Rao, <https://bit.ly/3ahZkju>

"A Brief Biography and Appreciation of Calyampudi Radhakrishna Rao, with a Bibliography of His Books and Papers," <https://bit.ly/31GD9j1>

most powerful for alternatives close to θ_0 . He and Poti published a paper, titled "On Locally Most Powerful Tests When the Alternatives Are One Sided" in *Sankhya* in 1946. Rao continued working on the problem after he was sent to Cambridge later in 1946 by Mahalanobis and published his seminal paper, "Large Sample Tests of Statistical Hypotheses Concerning Several Parameters with Applications to Problems of Estimation." This article became his second to be included in *Breakthroughs in Statistics, Vol. III*.

Rao followed this publication with several relevant articles. For example, in 1961, he showed how to construct a score-type statistic for comparing two nested multinomial models. It is now known that many of the most-used significance tests for categorical data analysis are score tests. These include McNemar's test, the Mantel-Haenszel test, the Cochran-Armitage test, and Cochran's test. Other score tests include a test of normality based on skewness and kurtosis proposed by R. A. Fisher and Karl Pearson in 1930, tests based on the partial likelihood for Cox's proportional hazards model, and locally most powerful rank tests

in nonparametric statistics. Rao's test has had an immense effect on econometric inference and is now the most common method of testing used by econometricians.

The score test began to receive increased attention as the foundation for development of hypothesis tests when nonlikelihood-based estimation methods such as generalized estimating equations became popular in the 1980s. Deficiencies in Wald-type tests in such settings were observed and, consequently, a flurry of development based on Rao's score test occurred, particularly in econometrics and biostatistics.

Multivariate Theory and Applications

In November of 1946, Rao went to Cambridge to analyze measurements from human skeletons brought from Jebel Maya in North Africa by the University Museum of Archeology and Anthropology. His task at the museum was to trace the origin of the people of Jebel Maya using the Mahalanobis D-square statistic. After his day job at the museum, Rao would spend his evenings in Fisher's genetics laboratory mapping the chromosomes of mice. More notably, he was Fisher's one and only PhD student and completed his dissertation, "Statistical Problems of Biological Classification," in 1948. The dissertation was read by John Wishart.

In the following three papers related to his dissertation, Rao laid the foundation for the modern theory of multivariate methodology:

- "Tests with Discriminant Functions in Multivariate Analyses," *Sankhya* 7 (1946)
- "Utilization of Multiple Measurements in Problems of Biological Classification," *Journal of the Royal Statistical Society Series B* (1948)
- "Tests of Significance in Multivariate Analysis," *Biometrika* 35:58–79 (1948)

He continued to make contributions in this area throughout his career and, 41 years later, was awarded the Samuel S. Wilks Memorial Medal, in part for major contributions to the theory of multivariate statistics and applications of that theory to problems of biometry. In 2002, Rao was awarded the National Medal of Science for pioneering contributions to the foundations of statistical theory and multivariate statistical methodology and their applications.

In conclusion, we would like to leave readers with an appreciation for Rao's place in history. He is one of 77 contemporary scientists in all fields listed in Mariana Cook's book, *Faces of Science*, and among a galaxy of 57 famous scientists of the 16th through the 20th centuries listed in the "Chronology of Probabilists and Statisticians" (<https://bit.ly/33OyYnO>), compiled by M. Leung at The University of Texas, El Paso. He produced 14 books (two of them translated into several languages), 475 research papers, 51 PhD students, and 42 edited volumes of the *Handbook of Statistics*. He received 38 honorary doctorates from universities in 19 countries spanning six continents. His special awards include the National Medal of Science, USA; India Science Award; and the Guy Medal in Gold, United Kingdom. Finally, results that bear his name include the Cramér-Rao bound, Rao's Score Test, Rao-Blackwell Theorem, Rao-Blackwellization, Fisher-Rao Theorem, Rao's Theorem, Fisher-Rao Metric, Rao Distance, Neyman-Rao Test, Rao least squares, IPM Methods, Rao's covariance structure, Rao's U Test, Rao's F Test, Rao's Paradox, Rao-Rubon Theorem, Lau-Rao-Shanbhag Theorems, Rao-Yanoi Inverse, Kagan-Linnik-Rao Theorem, and Fisher-Rao Theorem. ■

STATtr@k

Data for Public Good: Have You Considered Using Your Training Like This?

Jennifer Pearl



Photo courtesy of AAAS S&T Policy Fellowships.

The 2019–2020 class of AAAS Science & Technology Policy Fellows

While the world is in disarray due to the COVID-19 pandemic and people are waiting to see where everything lands, life continues onward. And your career is part of that.

The federal sector in the United States continues to show great appreciation for technical expertise in places both expected and unexpected. The President's Council of Advisors on Science and Technology has been reconstituted. The Government Accountability Office is beefing up science and technology (S&T) efforts. And the National Academy of Public Administration released a report (<https://bit.ly/31ETHic>) that recommends enhancing existing S&T resource support in Congress.

Specifically, offices across the federal government show high demand for science and engineering professionals with expertise in data. Run by the American Association for the Advancement of Science (AAAS), the Science & Technology Policy Fellowships (STPF) program matches statisticians, mathematicians, other scientists, and engineers with agencies where the need is easily apparent—the Bureau of Labor Statistics or US Census Bureau, for example. But fellows are also found helping drive data-intensive efforts at agencies where the need may not be as obvious, such as the Department of State and Department of Agriculture.

The STPF program receives requests from executive branch agencies for fellows at a pace well beyond what it can recruit—about a third of these unmet requests were for fellows skilled in data science. And fellowship finalists who have backgrounds in statistics, mathematics, and computer science often land more than double the number of interviews as other finalists.

Jiayang Sun (STPF class of 2019–2020) is chair of the department of statistics at George Mason University. She was among the first science policy fellows to be sponsored by a consortium of organizations: ASA/ACM/AMS/IMS/MAA/SIAM. Placed at the US Department of Agriculture, she

helped develop and support the Partnerships for Data Innovation initiative to meet challenges in feeding the world sustainably. She came to the fellowship with the aim of building networks and find research opportunities of national relevance, “promot[ing] proper use of statistics for evidence-based research, and contribut[ing] to making a better society.”

Samantha Tyner (STPF class of 2019–2020) was the Bureau of Labor Statistics' (BLS) first STPF fellow. She just completed her fellowship as a statistician in the BLS Office of Survey Methods Research, where she focused on interactive data visualization, text mining, and effective communication to wider audiences.

After the fellowship, STPF fellows move on—often in leadership roles—to every sector; some remain in government. When the Big Data Regional Innovation Hubs (<https://bit.ly/30KJ47o>) were established by the National Science Foundation in 2015, four STPF alumni were at the helm of three of the four hubs.

The yearlong STPF fellowship runs from September through August and includes close to 300 fellows who represent a broad range of backgrounds, disciplines, and career stages. Fellows broaden their career paths while engaging with policymakers and thought leaders. After their fellowship, fellows become members of a strong corps of 3,400+ alumni—policy-savvy STEM leaders in academia, government, industry, and the nonprofit arena.

Cautionary tales abound about what can happen when data is misused, but the right use of data by the government can help identify and solve every type of policy problem, from health to housing. The key to improving the government's ability to collect and analyze data to inform decision-making—as well as implement the right data policies to protect the public—is to have individuals at the table who are well-versed in areas including statistics, analytics, and machine learning.

Statistics expertise applied toward the public good is in demand and in our best interest. Learn more about the STPF fellowship at stpffellowships.org. The deadline to apply is November 1. ■

Jennifer Pearl is the director of the Science & Technology Policy Fellowships (STPF) program at the American Association for the Advancement of Science (AAAS). Prior to coming to AAAS, Pearl was at the National Science Foundation for 12 years, where she served in the Division of Mathematical Sciences and Office of International Science & Engineering. She was a AAAS S&T Policy Fellow in 2002–2003 and has a PhD in mathematics.

Celebrating Hispanic Heritage Month

In celebration of Hispanic Heritage Month, we recognize the following 12 individuals from the Hispanic community who have made tremendous contributions to the math and statistics field. Read their biographies to learn more about how they entered the field of statistics, what they've accomplished, and how they became leaders in their professional careers.

Carlos I. Alatorre was inspired by his parents—particularly his dad, a math-loving engineer and strong advocate for academic excellence. As global senior director of real-world analytics and, most recently, senior director of medical and clinical development at Lilly Capabilities Center in India, he has helped Eli Lilly's mission to develop medicines that make life better for people around the world.



Alicia Carriquiry was born and raised in Uruguay. Given that she flunked the first statistics course she took in college, she never imagined she would end up embracing it as her career. Carriquiry joined Iowa State's faculty almost at the end of the last century, yet was the first female faculty to reach the rank of distinguished professor and the first faculty member to hold the President's Chair in Statistics.



From his first undergraduate social statistics course, **Samuel Echevarría-Cruz** fell in love with both the analytical precision and creative power of statistical methods. That love carried him through a PhD program in demography and into research on the health of Latinx populations in the US. He now spends his time teaching sociology courses to Austin Community College students and statistics in local MBA and MPH programs.



Born in Peru and raised in California, **Tanya Garcia** fondly remembers—as a 4-year-old—craftily fitting together the pieces of jigsaw puzzles. Puzzles took a new shape years later and her enthusiasm for solving mathematical and statistical problems blossomed. Now at UNC Chapel Hill as a tenured associate professor, Garcia works toward predicting precise, personalized, and robust progression profiles for neurodegenerative diseases.



Beimar Iriarte came to statistics at a later stage in life. After earning a master's in biochemistry and working on developing clinical laboratory methods, he realized the importance of statistics in experiment design and analysis, so he earned a master's in statistics.



Mario Marazzi was born in Puerto Rico, where he observed early on the difficulties that arise with unreliable official statistics. He started his career working on the macroeconomic forecast models used by the Federal Reserve in Washington, DC, but remained passionate about returning to Puerto Rico. In 2007, he was appointed the first executive director of the Puerto Rico Institute of Statistics.

A first-generation Mexican-American citizen and college student, **Miguel Marino** had a strong interest in mathematics and medicine and pursued a career in biostatistics. He learned statistical skills through dedicated mentorship at the University of California at Los Angeles and Harvard that he applies to address community and primary care research questions in health policy, health disparities, and preventive service utilization.



In a rural town along the US-Mexico border, **Brisa N. Sánchez** developed her love for math by making change for customers at her parents' small grocery store. Eventually, she earned her PhD in biostatistics from Harvard and became a professor at the University of Michigan before taking on her current position as Dornsife Endowed Professor of Biostatistics at Drexel University.

Adriana Pérez was born in Bogotá, Colombia, and earned her MS and PhD degrees in biostatistics from Tulane University. She fell in love with biostatistics after visiting Cenicafe. As a professor in the department of biostatistics and data science at The University of Texas Health Science Center at Houston, she has taught more than 1,950 students.



Robert Santos has worked across a wide range of leadership positions in research organizations and policy areas such as hunger, immigration, decennial census counts, education, health, immigration, the environment, housing discrimination, travel behavior, and elections. His expertise spans quantitative and qualitative research design, sampling, survey operations, and statistical analysis. He is ASA president-elect and will serve as the ASA's 116th president in 2021.

Growing up in rural Texas on the US-Mexico border, languages and code switching were learned assets. Discovering statistics paralleled **Bárbara Robles's** bilingualism: It was another amazing language asset to acquire and apply. She has been applying statistics and economics since grade school as a 4-H member and then a tax examiner for the IRS. She intends to "pay the wonders of statistical and coding languages forward" by sharing with the next generation of "Si se Puede/Yes We Can" math speakers.



Joan Georgette Staniswalis was professor emerita at The University of Texas at El Paso and a fellow of the American Statistical Association. While her father—John G. Staniswalis (US Army)—was posted overseas, Joan, her mother, and her sister resided in Panama City, Panama. Joan was deeply rooted in both Panamanian and US culture. Her fluency in the customs and languages of two lands—combined with her exceptional intelligence, spiritual sensitivity, and generosity—made her a beloved mentor to legions of students, colleagues, and co-parishioners. She passed away in 2018.

MORE ONLINE

Visit <https://magazine.amstat.org> to read the complete bios for these statistics leaders.

Getting Started in **DATA** for *Good*

Pro bono—literally “for good”—service has become more common in statistics and data science in recent years. Often called “Data for Good,” this growing movement has been embraced by individuals, companies, and professional associations. A number of organizations have sprung up to design and manage statistical volunteering projects, recruiting volunteers and connecting them with projects and organizations that will benefit from analytic support. This addresses a prominent need in organizations pursuing good causes: they often have data but lack statistical skills and resources to perform analytics and cannot afford to hire highly skilled consultants. In these situations, statistical volunteers have the opportunity to make a real *difference in the world doing what they love most*.

There are so many ways to get involved! Data for Good organizations seek volunteers to join new and ongoing projects. Student organizations connect people to research projects. Many hackathons and other events welcome first-timers with analytic skills. Many people involved in statistical volunteering remain unaffiliated, preferring the flexibility and close personal relationships of individual consulting. Also, many companies offer employees volunteer opportunities through work—although statistical projects are still few and far between, with more advocacy, volunteers, and projects needed.

Data for Good Organizations

Within the growing Data for Good movement, there are a number of volunteer organizations, each with a distinctive character. All of them are eager to work with new volunteers and can be a big help in getting connected to a first project.

Statistics Without Borders (SWB) is an outreach group of the American Statistical Association. Established in 2008, SWB is one of the first Data for Good organizations. To learn about Statistics



Without Borders, see their article in this special issue, check out their website (<https://sub.wildapricot.org>), or talk to one of their volunteers.

Another prominent Data for Good organization is DataKind. Founded in 2011 by data scientist Jake Porway, DataKind has grown rapidly to become a global organization making a great impact for social change, with thousands of volunteers working on dozens of projects. Headquartered in New York, DataKind has chapters and hosts events around the world. The organization combines the resources of a large number of volunteers with a smaller cadre of professional staff. With substantial financial support from foundations, grants, and other donations supporting a multitude of projects, DataKind is a powerful engine for using data and analytic science to make a difference in communities and around the world.

'Adding Analytics': A Case History

Being able to make an impact for good requires a relationship of trust between the analytic volunteers and the people and organizations who will use the results. This makes "adding analytics"—helping an organization where you are already volunteering in a nonstatistical capacity—one of the best ways to get started in Data for Good. Let me tell you about one of my first projects as an example.

After volunteering for Habitat for Humanity on a number of construction projects and getting to know some of the local leadership, the question of how data science could be used to support the organization was raised. When asked what they needed the most, they said finding more donors and volunteers. Every civic organization I have spoken with in the 15 years since has said the same thing.

I suggested doing a cluster of the communities in their area. Three clusters of communities were identified—one with lots of donors, another with many volunteers but fewer large donors, and a third dominated by the people they were trying to help. This identified communities likely to have many interested contributors where the Habitat chapter had little presence.

This project tells the story of how a lot of people get started in Data for Good and often continue going forward. A person can already be helping an organization in a nonstatistical way—working at the public library; walking dogs at the local animal shelter; volunteering at a school, house of worship, or community center. Data for Good so often begins

when people with analytic skills use them to help the organizations and causes they already support. We possess a rare ability so needed by groups across our communities that it can make a huge impact right where we live.

Doing Well by Doing Good

Statistical volunteering offers many advantages. In addition to the primary advantage of using our technical skills to support causes and organizations we care about, pro bono work offers opportunities for career development. While volunteering certainly looks good on a résumé—especially to desirable employers who encourage contribution to the larger community as an ordinary part of one's career—there is much more. People early in their career gain important practice and learn new analytic techniques. Volunteer consultants are able to broaden their experiences and gain practical experience in new techniques—something that can be limited in professional situations, which often focus on the same handful of methods used over and over for a commercial product. Statistical volunteering is often the best way to try out and enjoy a wide variety analytic tools and emerging technology.

Statistical volunteering often pairs more experienced data scientists and analysts with those having less experience. This naturally leads to mentoring relationships than benefit both parties. All participants benefit from networking with people from different backgrounds, skill sets, and work situations. More junior volunteers gain practical experience and the chance to work directly with the people needing the analysis—a quality often restricted at work, where newer team members rarely see anyone who directly uses their analysis. Statistical volunteers gain presentation skills, practical working experience, and confidence in their work. As experienced is gained, taking a larger role on volunteer projects creates opportunities for leadership, furthering career development.

The most important benefits of statistical volunteering, however, will never appear on a résumé but in the lives impacted by our projects. As statistical and data science professionals, the need for what we do every day on the job is so great, but volunteers are still far too few. The Data for Good movement has grown so rapidly because it makes so much more than a good résumé; it makes a career by making a real and tangible difference in our profession, our society, and our world. ■



With a PhD in statistical astrophysics, **David Corliss** leads a data science team at Fiat Chrysler. He is the founder of Peace-Work, a volunteer cooperative of statisticians and data scientists providing analytic support for charitable groups and applying statistical methods in issue-driven advocacy.

Statistics Without Borders: Professionals Using Statistics and Data for Social Good

Matt Brems, Marketing and Communications Director, Statistics Without Borders



Matt Brems is a managing partner at the consultancy BetaVector, a member of the distinguished faculty at General Assembly, and the marketing and communications director for Statistics Without Borders. He earned his bachelor's degree from Franklin College and his master's degree from The Ohio State University.

As a reader of this magazine, you almost certainly know how valuable smart statistical practices are to making data-driven decisions and how poor practices can quickly lead good efforts astray.

You may recognize high-profile stories of “statistics gone wrong,” like the thousands of people who incorrectly cried foul over Marilyn vos Savant’s “Monty Hall” and “two boys” columns in *Parade*, or that Sally Clark, Lucia de Berk, and Janet Collins were all found guilty of crimes in part due to invalid statistical inferences (see sidebar).

You likely also have your own experiences! Maybe you’ve seen a colleague improperly generalize results from a sample or you’ve heard clients conflate correlation with causation. To make a long story short, you know firsthand what happens when organizations and teams don’t employ best statistical practices. As a reader of this magazine, it probably drives you nuts!

We have these experiences, too. And at Statistics Without Borders, we help others avoid critical statistical mistakes.

In just about every case, *organizations want to use best statistical practices*. But many organizations may not have the time, expertise, or financial resources

to cut through the noise and understand how to best proceed.

- Prospective clients are continually learning more about the role smart statistical practices play in their organization’s success.
- The rate at which new tools are developed can inflate the perceived importance of tools and diminish the perceived importance of the statistical methods that undergird them.
- Flashy methods, misinformation, and buzzwords contribute to the cacophony of advice out there, making it difficult for clients to know what best practices look like.

In particular, nonprofit and social good organizations are often already strapped for resources, so they tend to be disproportionately likely to need statistical consulting and data support.

That’s where Statistics Without Borders (and you!) come in.

Who Are We?

Statistics Without Borders (SWB) is a team of more than 1,600 volunteers, including statisticians, data scientists, researchers, teachers, psychologists, economists, epidemiologists, consultants, and public health professionals. The

vast majority of our projects are completed remotely, enabling us to have a global reach—while 60 percent of our volunteers are based in the United States, our membership spans 60 countries across six continents and 77 spoken languages.

Our volunteers, with diverse backgrounds and experiences, are the true powerhouse behind what we are able to accomplish. Volunteers help us execute our vision, which is that “SWB aims to improve decision-making and knowledge in efforts that promote welfare through the proper application of statistical principles and best practices, where access to such resources is limited.”

We think it’s a great mission! Let’s break that mission down and discuss specifically what SWB does.

What Do We Do?

You name it, we’ve probably done it:

- Survey sampling in South Sudan
- Survival analysis in Sierra Leone
- Monitoring and evaluation in East Africa
- Time series analysis in Tigray
- COVID-related data analysis in the Caribbean, United States, and Asia

Statistics Gone Wrong

High-profile stories of “statistics gone wrong”:

Marilyn vos Savant’s Monty Hall Problem

<https://bit.ly/2PLISOR>

The “two boys” column

<https://bit.ly/2DUN8c8>

The case of Sally Clark

<https://bit.ly/2XTQovz>

Conviction by Numbers

<https://go.nature.com/2DTUpsT>

People v. Collins

<https://bit.ly/33Sh2Zr>



Based in Sierra Leone, the Tacugama Chimpanzee Sanctuary rescues and rehabilitates chimpanzees, conducts wildlife research, and promotes environmental education. (photo courtesy of SWB)

For the past 11 years, we have volunteered our time and expertise to complete more than 120 projects for organizations around the world. You may recognize some of the organizations we’ve served, like the Save the Children Fund, the World Food Programme, or the United Nations Office for the Coordination of Humanitarian Affairs. Some organizations may be less familiar to you, like the Asante Africa Foundation, the Tacugama Chimpanzee Sanctuary, and the American Alliance for pPROM Support. By providing data support and statistical knowledge, our volunteers have empowered these organizations and many others to do more good.

In the last year alone, we’ve worked on more than 20 projects. At this point, you might be wondering: What does a project actually look like?

How Do We Operate?

Right off the bat, we’re different from a lot of statistical consulting organizations in that we operate with a zero-dollar annual budget. That’s right—we’re driven by volunteers who serve in many capacities to bring clients in,

finalize what a project may look like, and execute it. (We would be remiss if we did not acknowledge the support we get from the American Statistical Association, which subsidizes our website.)

Let’s use the Tacugama Chimpanzee Sanctuary as an example to see what a project looks like, start to finish.

Based in Sierra Leone, the Tacugama Chimpanzee Sanctuary (TCS) rescues and rehabilitates chimpanzees, conducts wildlife research, and promotes environmental education. Between 2005 and 2016, there was a considerable number of chimpanzees that, unfortunately, died due to a mystery illness. TCS reached out to us in 2016 to see if we could assist them in uncovering causes of the disease.

When TCS reached out to SWB, they spoke with our new client acquisition team. This team explains what SWB does and doesn’t do, and they help vet clients to make sure the client and proposed project both align with SWB’s mission. We found that, yes, helping the sanctuary was a great fit for an SWB project.

Next, the sanctuary was connected with a project manager and statistical expert. (We call these our project and client managers and our statistical consultants—PCMs and SCs for short.) The PCM is an SWB volunteer who is responsible for overseeing the project and ensuring its successful delivery. The statistical consultant is another SWB volunteer who makes sure the project is completed in a statistically rigorous manner.

Once the PCM and SC agreed with Tacugama Chimpanzee Sanctuary about what the deliverables needed to be—in this case, a written report detailing the analyses completed and insights found—the PCM and SC put out a call for volunteers to recruit additional SWB volunteers to staff the project. This team included a medical school professor and a recent industrial engineering program graduate.

Finally, the SWB team assigned to this project worked with the Tacugama Chimpanzee Sanctuary to gather medical and environmental data and got to work. Early iterations of the project included summary

statistics and a conclusion that more information was needed. Later versions included more complex modeling such as survival analysis via Cox modeling. Throughout this project, one final volunteer completed quality assurance work to independently verify our projects are being completed at a high standard and are thoroughly documented.

MORE ONLINE
Engage with
Statistics Without
Borders on Twitter
at @SWBprobono.

After the project work was completed, the team presented and delivered its results to Tacugama Chimpanzee Sanctuary. We formally closed out the project once stakeholders from the sanctuary and SWB quality assurance signed off. In 2018, the Tacugama Chimpanzee Sanctuary reached out and asked us to re-engage with them—this time to help them evaluate the effectiveness of one of their environmental awareness campaigns.

We're always looking for ways to improve. However, after well above 100 completed projects and plenty of satisfied clients—some of whom want us to help again—we have to say we're immensely proud of the positive impact we've had throughout the world over the last 11 years.

But we are just getting started, and we'd like your help.

How Do You Get Involved?

There are three main ways for you to get involved:

1. SHARE POTENTIAL CLIENTS

WITH US. We have lots of volunteers, and there's no shortage of teams that could benefit from some pro bono statistical assistance. If you know of a local community organization that may want

some consulting work done or you have a connection with someone at a non-governmental organization (NGO), we would greatly appreciate your referral. Encourage them to reach out to us or connect us via email at statisticswithoutborders@gmail.com.

2. FOLLOW US ON SOCIAL MEDIA.

Engage with us on Twitter at @SWBprobono, find us on LinkedIn, or head to our website at <https://statisticswithoutborders.org>.

3. PERHAPS THE MOST OBVIOUS WAY FOR YOU TO GET INVOLVED

IS TO VOLUNTEER. If the idea of contributing your time as a PCM, an SC, or a quality assurance team member excites you, we'd love to hear from you. Want to just sign up to see if there are any projects that interest you? Check us out! We've also got other roles we didn't mention here. If operations or marketing/communications are more your thing, reach out. As an organization that operates with no money in our annual budget, we rely on the time and talents of our exceptional volunteers. Join us in making better use of data and, in doing so, making the world a better place.

Want to learn more? Check out our other article, "SWB Volunteers Share Experiences, Rewards," beginning on Page 36 of this issue, or head to our website at <https://statisticswithoutborders.org>. ■

MSRI

Apply for the African Diaspora Joint Mathematics Workshop (ADJOINT) - June 21 - July 2, 2021

ADJOINT 2021 takes place June 21 through July 2, 2021 at the Mathematical Sciences Research Institute (MSRI) in Berkeley, California. This workshop is designed to provide opportunities for in-person collaboration to U.S. mathematical scientists, especially those from the African Diaspora, who will work in small groups with research leaders. **At least one research project will be in biostatistics.**

Applicants must be a U.S. citizen or permanent resident, possess a Ph.D. in the mathematical sciences, and be employed at a U.S. institution. Accepted participants will receive support for one round-trip travel to Berkeley, lodging and meal expenses, as well as opportunity for future conference travel.

To learn more and apply via MathPrograms, visit:

www.msri.org/adjoint



Apply by
December 15, 2020

HRDAG Answers Human Rights Questions on Large Scale

Maria Gargiulo and Christine Grillo, HRDAG

There are so many ways data science can provide answers to questions about how to effect positive change in the world. As the organization's name suggests, the Human Rights Data Analysis Group (HRDAG) uses data science to answer questions about human rights on a large scale, from determining chain of command and accountability in international cases of genocide to evaluating whether artificial intelligence-based tools used by the US criminal justice system are fair.

HRDAG was born in 1991, when its database analysis identified the 100 worst officers in the Salvadoran military during that country's civil war. As part of the peace process, and thanks to the organization's data analysis, those officers were forced to resign. Fast forward to Guatemala in 2013: HRDAG's expert analysis was used in the trial of Gen. José Efraín Ríos Montt, who was found guilty of genocide in his own country. Fast forward again to Senegal in 2015, where HRDAG expert analysis helped a panel of judges decide on a verdict for Chad's former leader, Hissene Habré, finding him guilty of crimes against humanity, war crimes, and torture. He was sentenced to life in prison.

Expert testimony is not the whole story of HRDAG, however.



Supporting the Humanitarian Law Centre, the organization's researchers evaluated and collaborated on the center's Kosovo Memory Book to commemorate people who were killed or disappeared in relation to the armed conflict. An ongoing project in Syria involves working with the UN and several local partners to deduplicate data and arrive at scientifically rigorous casualty enumerations, as well as a project to complete a rigorous and scientifically sound estimate of casualties.

And not all of HRDAG's work revolves around war. Some of the organization's most recent projects delve into the global coronavirus pandemic. As will likely be the case for years to come, most of the available data sets on the COVID-19 crisis are incomplete and unrepresentative, creating a great deal of

uncertainty in what is known about the virus and the disease. But making sense of imperfect data sets is at the heart of what HRDAG does. So far, the organization has published two articles in *Granta* about the virus—the first about case fatality rates (<https://bit.ly/2PNxjGQ>) and the second about how to interpret antibody tests (<https://bit.ly/30QGkp9>). The organization's researchers have also published articles in *Significance*—about the models used to estimate infection rates (<https://bit.ly/31LpIOz>) and the susceptible, infectious, and removed model used by epidemiologists (<https://bit.ly/33TBskY>)—as well as a paper about a framework for modeling the number of cases using only mortality data (<https://bit.ly/3alit3U>).

HRDAG has also been involved for many years in statistical analysis that can inform our conversations and thinking about the US criminal justice system. In 2016, its work was represented in a *Granta* article about homicides committed by police (<https://granta.com/violence-in-blue>), estimating one third of all Americans killed by strangers are killed by police. This past summer, during a national uprising sparked by the murder of George Floyd by police, *Granta* refreshed that article with a new introduction.



Maria Gargiulo earned a Bachelor of Science degree in statistics and data science and Spanish literature from Yale University in 2019. She conducted field research on intimate partner violence in Nicaragua and was a data science fellow at the US Census Bureau. She's also an avid tea drinker.



As the communications hub at HRDAG since 2013, **Christine Grillo** manages editorial content for the organization. She is also a science writer whose work has appeared in such publications as *The Atlantic*, *Audubon*, and *The New York Times*. She has taught creative writing and English composition at universities in Baltimore and New York, and she teaches workshops at the Johns Hopkins Bloomberg School of Public Health to assist scientists in communicating more effectively.

“
This team believes its most important mission is to grow the field of data scientists who work at the intersection of statistics and human rights.”

Other work by HRDAG has involved evaluations of predictive policing tools that rely on artificial intelligence and pre-trial risk assessment tools that use existing data. Consistently, HRDAG has found that instead of cleansing the justice system of human biases, these tools perpetuate and exacerbate unfairness that's been baked into the system—and its data sets—by decades of unjust policing practices.

But HRDAG is not content to simply do the data science. This team believes its most important mission is to grow the

field of data scientists who work at the intersection of statistics and human rights. To that end, the organization prioritizes training new scientists in the field through internship and mentorship programs onsite at their office in San Francisco. A year ago, HRDAG invited Valentina Rozo Ángel, a researcher at Colombian human rights NGO Dejusticia, to collaborate as a visiting analyst. Through her work with HRDAG, Ángel was an author of a report estimating the number of social movement leaders killed in 2016 and 2017

in Colombia. After finishing her time at HRDAG, Ángel took a position as a data scientist at the Truth Commission in Colombia and uses the skills she developed at HRDAG to study the impacts of conflict on Colombian society and contribute to the truth and reconciliation process.

Another HRDAG success story in growing the field is hiring statistician Maria Gargiulo early this year. She got to know the HRDAG team in 2018 when she worked there as an intern. Her experience taught her she doesn't have to choose between dedicating her career to statistics and social issues (<https://bit.ly/3kAYnHA>). That summer, Gargiulo learned it's possible to innovate ways to use statistics to support advocacy and positive change in the world, and when she was hired in February, she was able to hit the ground running.

The COVID-19 crisis, criminal justice system bias, and human rights abuses may stay with us for a while, but HRDAG is using data science to help colleagues and lay persons understand what's happening and what it means. They supply the evidence for evidence-based policies that have the power to make the world fairer and support accountability and justice for all. ■

BASS GOES VIRTUAL

The 27th meeting of the **Biopharmaceutical Applied Statistics Symposium** (BASS XXVII) will be held virtually September 9–10. One-hour tutorials on statistical issues relevant to the COVID-19 pandemic will be led by speakers from academia, the pharmaceutical industry, and the US Food and Drug Administration. Michael O'Connell will deliver the keynote address.

BASS is a nonprofit entity established to support graduate studies in biostatistics. It has supported more than 50 master's or doctoral-degree graduate students in biostatistics. For further information, contact the BASS registrar at Rewhitworth@gmail.com or the BASS chair, Tony Segreti, at segretia@bellsouth.net. The BASS webpage may be viewed at www.bassconference.org.

LGBTQ+ Advocacy Committee Engages in Good

Jack Miller

JSM 2020 has just passed us by, and I hope the theme of “Everyone Counts: Data for the Public Good” resonated with you. As David Corliss told us in his JSM 2019 review, “advocacy groups remind us Data for Good is more than papers and presentations. Direct service to individuals is an important channel.”

There is a lot of good happening in the ASA! We are fortunate to have the ASA LGBTQ+ Advocacy Committee, Committee on Minorities in Statistics, Committee on Women in Statistics, and Committee on Statistics and Disability as official ASA committees. We also have the Caucus for Women in Statistics, and a proposed new interest group on diversity and inclusion is gathering signatures for consideration as an official ASA interest group. Both Past President Karen Kafadar and President Wendy Martinez have initiatives related to diversity and inclusion. The emphasis on diversity, equity, and inclusion will continue with President-elect Rob Santos. As I mentioned, members of the ASA are fortunate.

I write as the chair of the ASA LGBTQ+ Advocacy Committee and a member of Wendy’s LGBTQ Inclusion and Diversity (LID) working group. Unfortunately, 2020 has not been a banner year in many ways. Rather than focusing on the ills, I decided to focus on the good efforts we have been engaged in.

Jiashen You (vice chair of the ASA LGBTQ+ Advocacy Committee) and I have been working together to keep our committee active. Unfortunately, COVID-19 put a crimp in our plans to have regular committee meetings, but we have had a few calls and emails.

In May, David Marker shared with our committee a post from the Daily Kos about the difficulties some LGBTQ+ individuals have responding to the census (<https://bit.ly/3ajY3In>).

Some of us (including me) experienced that ourselves and shared our stories; others shared excellent resources, including the Federal Committee on Statistical Methodology’s Measuring Sexual Orientation and Gender Identity Research Group’s working papers (<https://bit.ly/2PMohKf>) and the *Journal of Official Statistics* special issue on measuring LGBT populations (<https://bit.ly/33ZPiCt>).

Also, you can read about committee member Deirdre Middleton’s work with her team on the challenges facing LGBT individuals during the COVID-19 pandemic (<https://bit.ly/33SzPE0>).

Finally, committee member Qing Wu shared his friend’s work on how an app was used to quickly gather, share, and analyze COVID-19 data (<https://bit.ly/2PPkiIh>).

The LID working group has been active, as well. One subset of the group is examining best practices for gender and sex as variables. Another subset has been working on a website (<https://bit.ly/3avQgaR>) to increase LGBTQ+ visibility and representation in the ASA. In June 2020, Wendy’s President’s Corner featured “A Conversation to Celebrate Pride Month” with Suzanne Thornton and me. Both Suzanne and I (and many other LGBTQ+ individuals) are grateful Wendy has LGBTQ+ inclusion as one of her presidential initiatives.

Also in June, several of us had a virtual Pride Month celebration organized by Brittany Green, Donna LaLonde, Suzanne Thornton, and Ben Toh. It was wonderful to have other LGBTQ+



Jack and Luna.
(photo courtesy of
Kat Ku Modern Pet
Photos)

individuals and our allies meeting together to celebrate the 50th anniversary of the remarkable strength a few transwomen of color had at the Stonewall Inn on June 28, 1969.

Our virtual celebration included fun (and some talent), but it also included some solemnity, including a reading of “Still I Rise” by Maya Angelou. We have come far since Stonewall, but there is more work ahead of us.

I have long thought we cannot have true equality when there are still inequalities, particularly those of us in minority groups (not to mention those of us with intersectionalities). In late 2019, the chairs of several minority-focused ASA committees and other like-minded individuals talked about having a broader umbrella group that would allow more ASA members to participate in diversity and inclusion efforts. Many thanks to Saki Kinney and Donna LaLonde for organizing the efforts to propose an ASA Diversity and Inclusion Interest Group (DIIG). Julia Sharp has graciously volunteered to be the interim chair of this new group.

By the time you read this, the petition and charter will have been submitted to the Council of Sections. We hope DIIG becomes an official ASA interest group and invite you to join us. We can all come together to do good—with data, with our teaching, with our mentorship, with our allyship, and with our advocacy. May we all be allies to and advocates for each other. ■

MORE ONLINE
Visit the LGBTQ+ website at <https://sites.google.com/view/asa-lgbtq/home> for up-to-date information and resources.

Peace-Work: Crowd-Sourcing Statistical Volunteering for the Greater Good



With a PhD in statistical astrophysics, **David Corliss** leads a data science team at Fiat Chrysler. He is the founder of Peace-Work, a volunteer cooperative of statisticians and data scientists providing analytic support for charitable groups and applying statistical methods in issue-driven advocacy.

Peace-Work is a volunteer cooperative of statisticians, data scientists, and other researchers applying analytics to issues in issue-driven advocacy and social justice. Although Peace-Work has been around for just a few years, formally organized in 2014, its founding members have a long history in individual statistical advocacy. An all-volunteer organization, Peace-Work projects are often in academic and policy research, with volunteers as likely to be found working with government economic data to write a position paper as they are working hand-in-hand with a social justice organization.

A distinctive feature of Peace-Work's statistical research and advocacy is crowd-sourcing time. This is like crowd-sourcing dollars from supporters, except Peace-Work crowd-sources volunteer hours from the statistics and data science community. With no paid staff or other financial resources, larger projects are broken into small pieces to accommodate volunteers' busy schedules. This business model is reflected in the play on words in the name: Peace work is what we do, and piece work is how we operate.

Peace-Work connects volunteers with organizations and data sets, often from governments and other official sources, to address issues they care about deeply. Projects can be as varied as the interests of the volunteers. With a practice focusing on advocacy, projects have included drivers of education success and failure, root cause analysis of homelessness, descriptive statistics of privilege and the impact of racial bias, environmental research, promoting and participating in hackathons, and policy analysis. The focus on crowd-sourcing hours means projects can be in any area of Data for Good. Some volunteers contact us to find an organization in their particular area of interest, and organizations reach out to find statistical support to further their good work.

Community involvement is strongly encouraged. Volunteers regularly participate in hackathons and ASA events such as DataFest, visit colleges to talk to student groups, and present at conferences. They rely on the software tools of their choosing, and open source tools are common. People are encouraged to share their applications, methods, and source code with the wider D4G community.

This also gives Peace-Work a character of intersectionality. For example, food deserts intersect with disproportional poverty among persons of color, which in turn relates to homelessness, which is connected to structural issues in education, which leads to the school-to-prison pipeline, and on and on.

Peace-work volunteers often collaborate with subject matter experts in different areas to combine their expertise on complex, multifaceted problems. Once, when presenting on human trafficking at a large international conference, a Peace-Work researcher saw several people come into the room who all knew each other but didn't know the others planned to attend. Their area of interest was money laundering. They came to the talk because they discovered a strong connection to human trafficking—something even the presenter didn't know previously.

While the problems and issues D4G researchers address are often studied in some degree of isolation, Peace-Work's community-based model shows how a broad-based community approach helps develop holistic analytic solutions for data-driven policy to address intersectional issues.

Since the outbreak of COVID-19, much of the research at Peace-Work has focused on aspects of pandemics. Projects have included disproportionate impact of the pandemic on marginalized communities such as BIPOC [Black, indigenous, and people of color], the homeless, and prisoners. We have considered the impact of differences in practices reflected in the widely varying outcomes in different states. At the Conference on Statistical Practice next February, the annual ethics panel will focus on the ethical issues raised in both data and analysis. Statistical issues raised by these questions include biases in detection and reporting, best metrics for



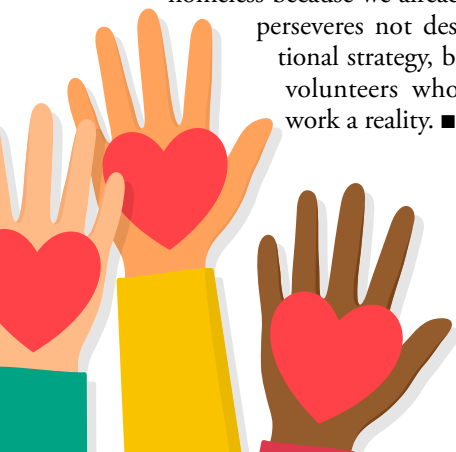
tracking the pandemic, geospatial analysis and visualizations, and pooled testing.

Ongoing areas of interest for Peace-Work are often the most severe challenges afflicting society—homelessness, addiction, the rise of internet hate speech, school shootings, and even genocide. One major initiative is human trafficking research, with studies on risk factors, geographic distribution, and data-driven policy advocacy.

Affiliated with the Global Association of Human Trafficking Scholars and partnering with local organizations fighting human trafficking organizations, Peace-Work researchers combined demographics from federal agencies with victim counts from the national hotline operated by Polaris. This was used to perform a meta-analysis, combining Polaris data from each state to identify factors predictive of a high level of human trafficking while accounting for variations between the states. The fixed effects found by the state-level meta-analysis were then applied to data on large cities to create a decision tree model to identify potential unidentified centers of human trafficking activity.

Peace-Work recently developed a model to identify legislative and government practices most effective at identifying perpetrators and victims. This was done by comparing actual per capita confirmed victim rates to the model. The practices of states consistently outperforming the model are compared with those most likely to be missing in poorer performing states. Identifying these best practices allows Peace-Work volunteers to partner with state-level advocacy groups to comment on proposed legislation so it is more effective.

Peace-Work’s unusual business model—crowd-sourcing hours instead of dollars to support a 100% volunteer organization—offers some surprising advantages. Remaining an independent research group—not tied to any university, organization, or government agency and broke by design—certainly has its challenges. However, it also means Peace-Work can’t be de-funded and shut down—certainly a plus in today’s highly polarized environment where even hard science can become a political football. We will never stop a project due to losing a grant because we don’t have any. And we aren’t afraid of becoming homeless because we already are. The organization perseveres not despite its unusual operational strategy, but because of it and the volunteers who make this important work a reality. ■



STATtr@k: A Place to Start Doing Data for Good

One of the most important resources for students and people just getting started in a career in statistics is STATtr@k (<https://stattrak.amstat.org>). Produced by the American Statistical Association and open to the public, STATtr@k is “geared toward individuals who are in a statistics program, recently graduated from a statistics program, or recently entered the job world.” Their website pulls everything together, providing access to an extensive collection of resources for early-career statisticians.

Content and Resources

From mentoring programs to articles with valuable career advice to information about applying for scholarships and fellowships to educational opportunities and students in the news, STATtr@k is a hub for information about early-career development. You can find out about hackathons and learn from others’ experiences to improve your performance; get the skinny on conferences and learn about the work of local chapters, ASA sections, and other organizations.

One of the most valuable aspects of STATtr@k is the opportunity to gain writing experience and get people to see your work by submitting articles. You can share your experiences, along with opportunities and useful information for students and early-career statisticians.

STATtr@k and Data for Good

Looking to get started in Data for Good? STATtr@k is a great place to research opportunities, learn about what others are doing, and get connected with a project that meets your interests and develops your skills. It’s also a great place to let people know about your Data for Good projects and recruit newcomers to your important work. Using the search function

STATtr@k: Just the Facts

<http://stattrak.amstat.org>

- Includes sections for awards and scholarships, getting in touch with ASA chapters, information about student chapters, career support, and other resources
- Updated monthly
- Includes a search function, including archives
- Developed and maintained by the American Statistical Association
- Submit articles at <http://stattrak.amstat.org/about/submit-an-article>

(it’s in the upper right corner of every page), look for the subjects and opportunities that interest you most.

One such feature article is “The Local Chapter Is My Justice League,” by Scott McClintock (<http://stattrak.amstat.org/2018/06/01/justiceleague>). In it, he describes his local ASA chapter as his Justice League, where collaborators work together to use their “statistical super-heroism for the greater good.”

The list of resources and possibilities for good work goes on and on! If you don’t find information about a particular program, it means you have the opportunity to write about it and submit it to STATtr@k so others can benefit from your experience.

All of us have a role to play in developing the statistics—and the statisticians—of the future. Becoming users and even contributors to STATtr@k’s work in nurturing early-career statisticians helps make Data for Good an important part of their statistical career. Visit <http://stattrak.amstat.org> and find your place in moving statistical science forward as a powerful means for doing good in our society, our communities, and our world. ■

Data for Good Tech COOL SCIENCE for HOT PROJECTS

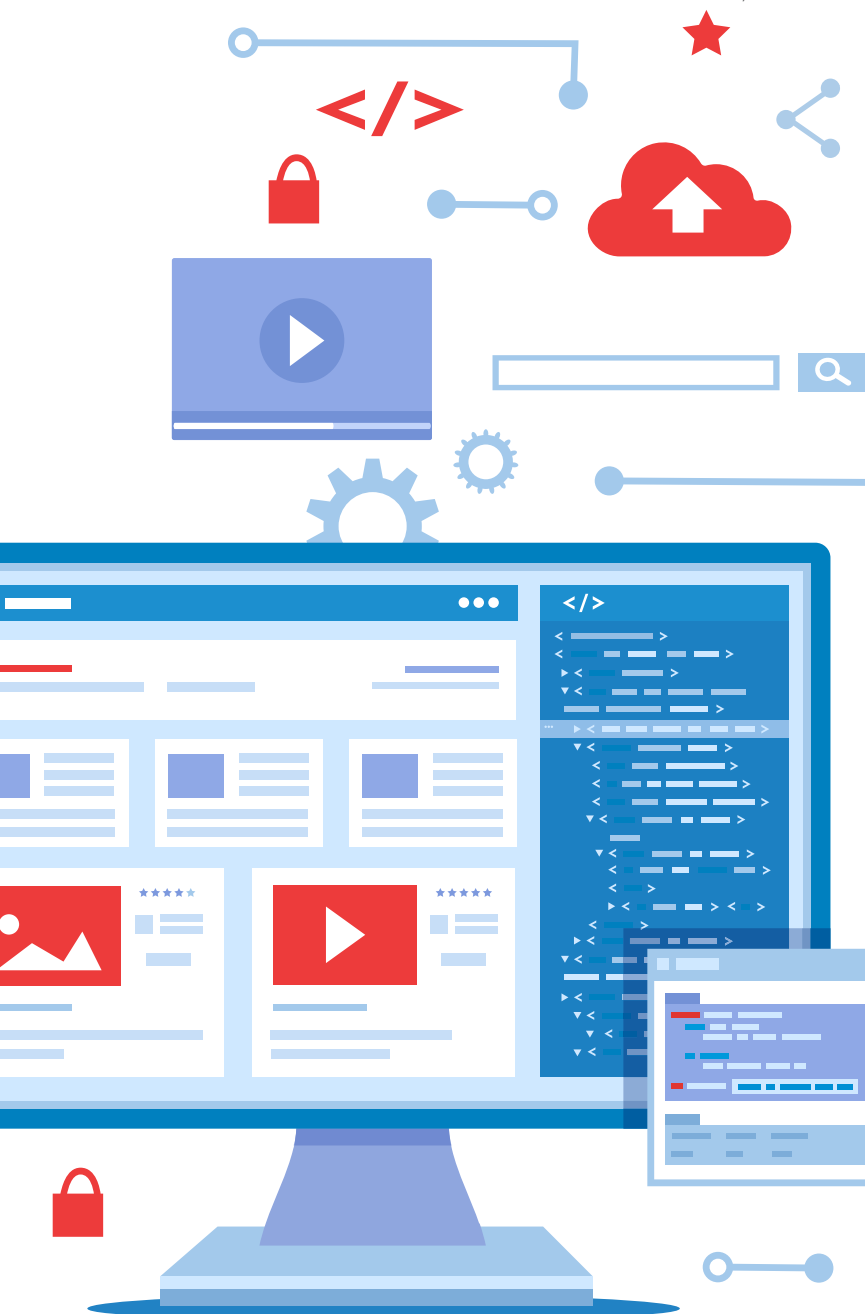
David J. Corliss, Peace-Work Founder and Director

Data for Good is a place where high technology and deep problems meet. This often involves learning new statistical methods or even helping to develop new ones. One of the great aspects of D4G is that the technology never stands still. Trying out new ideas and developing novel applications for established methods are needed to make the greatest impact, as constant reinvention drives new solutions. For some ideas and inspiration, here are a few examples of where Data for Good tech is leading the way.

Quantile regression could be a nominee for the most under-used statistical technique in all of analytics. This method creates separate regression lines for specified percent slices (e.g., the 50th percentile models the median). All the statistical software packages have it, so you can find code examples in the language you prefer.

You might hear quantile regression is useful when the conditions imposed by the central limit theorem on ordinary regression are not met. That's true, but definitely not the whole story. Even for a set of perfectly normal, perfectly randomly distributed Bernoulli trials (pretty sure you'll never see one outside of a homework problem), simple regression only gives the *mean* of the response variable. As a result, we can be left without any clear understanding of what happens outside the central tendency.

In Data for Good, that's often where the action happens: social concerns, rare events, extreme cases, and other questions where the answer is found far from the mean. We can't very well model homelessness, toxic waste spills, deaths in police custody, economic one-percenters, children who die from COVID-19, or almost anything it seems we really want to know by only looking at what happens to *most* folks. A mistake made by many is learning a few regression



methods in school and not adding to the list throughout a career. With so many regression methods available, try to look around to find a few best suited to your particular problem. If quantile regression isn't in your analytic arsenal now, maybe think about adding it.

Another much over-looked analytic method is **survival analysis**. The name is unfortunate, because it's really for modeling the time until some event occurs—not just things that eventually fail. It can be used to find how long it takes a person to learn something, recover from a disease, even complete a PhD! Modeling the time to some event has been used to understand the evolution of substance abuse cases, assess the resiliency of a damaged ecosystem, evaluate the effectiveness of public policy decisions, project the results of program fundraising campaigns, and much more. Survival analysis to model the time to some event is one of the basic, bread-and-butter D4G techniques used over and over again.

Principal components analysis (PCA) is another method with more than often meets the eye. Usually thought of in terms of dimensionality, simplifying many predictive variables into a few, it can provide important benefits in D4G analysis. Properly applied, PCA is a powerful diagnostic tool for understanding and explaining the key drivers of the phenomenon in question. The key extra comes from thoroughly investigating the factors comprising each principle component. Digging into what they have in common can often provide valuable insight into root causes.

For example, a study of risk factors for victims of human trafficking found several related predictors associated with new homelessness, such as foreclosure rates, but not chronic homelessness. Identifying a common theme in the fields comprising a principal component led to the finding that youth programs for preventing homelessness also lowered the risk of them becoming victims of human trafficking.

Principal components can also be used to find “tracers”—easily observed features correlated to something not directly related that is difficult to observe. A common example is body temperature as a tracer for infection. A thermometer doesn't measure serum levels of a pathogen but can be used as an indicator due to being correlated.

Tracers can be found by plotting principal components along with all variables; a tracer is easily

measured and points in the same direction as a principal component that is difficult to measure. As an example, gentrification can be complex and difficult to measure. However, changes in chronic homelessness are much easier to measure and trace changes in gentrification, which is a major driver of the metric. Plotting principal components against all observables can find these tracers.

Capture recapture (CRC) is a great example of a well-established D4G method finding a vitally important new application. This is one of the oldest techniques around, developed in the late 1800s to estimate and track the size of biological populations. It became one of the most important tools in ecological D4G ... and pretty much stayed there for a century, until Patrick Ball came along.

Ball, founder of the Human Rights Data Analysis Group (HRDAG, <https://hrdag.org>), applied CRC to human rights abuses, starting with the Bosnian genocide. HRDAG continues to lead in the development and application of advanced statistical methods to some of the worst problems in the world today, and capture recapture has become one of the most important analytic tools in Data for Good, tracking everything from deaths in police custody to the rise of hate sources on Twitter to government suppression of press reports.

Text mining is one area undergoing rapid technological advancement, leading to many important success stories in Data for Good. Mining social media text has been applied to many cases, from finding under-counted COVID-19 cases to tracking the rise of hate speech sources on Twitter. One particularly outstanding example is Tom Sabo's work fighting human trafficking by mining social media, decoding the language to identify ads for people. Analysis of social media text often borrows from methods and code from sentiment analysis. The open-source Python Natural Language Toolkit is a tremendously valuable resource—for text analytics in Python, it is a must.

These are just a few examples of how both new technology and new uses of established methods are a driving force in Data for Good. They also have important benefits, as tech learned and skills developed for D4G projects can be applied to any analytic activity. Trying out new ideas and adapting existing technology to applications makes D4G tech a powerful force in working for the greater good. ■



Legislative Advocacy and Data Science

Sarah Warner, Chair of Legislation and Policy for End Slavery Cincinnati Anti-Human Trafficking Coalition

Data has no political party, its numbers no ulterior motive. Facts as they are proven create a sturdy framework that can withstand the railings of misinformation and unconscious bias. In a world fraught with emotion and layered with mixed messages from the media, data can help cut through the noise and paint a picture to legislators of urgency, need, impact, and hope that is universal and accessible from both sides of the aisle. Data and analysis wielded in tandem with strategic lobby work creates a tangible launching point for effective conversation in the greater dialogue of legislative advocacy.

Legislative advocacy is an all-encompassing term that is so much more than simple lobbying. My focus in advocacy work has centered on human trafficking, poverty, and domestic violence over the years and has ranged from having legislative meetings with members of state and national legislature, providing testimony on bills, organizing group lobbying and testimony efforts, training others for interaction with their legislators, meeting to propose new legislation, and providing consultation behind the scenes on current and upcoming legislation. The result has been the passing of bills related to the tax on women's hygiene products, foster care transparency laws, human trafficking survivor protections, and more. Working with both sides of the aisle, and in a network of other passionate leaders, great changes have been made with more to come.

However, the road to effecting new legislation is long and often frustrating. It may take weeks to get a meeting with your legislators. Bills fall on and off committee schedules seemingly at random, sometimes even losing steam in their first or second hearing, never to be seen again without efforts by the community to resurrect them. Organizing groups of advocates can be like herding cats, and providing enough education to those working on the issue can be time consuming. Writing and presenting testimony can be daunting, and while anyone can testify on a piece of legislation, few provide the training to do so with confidence. All of this becomes worth it when you see the fundamental change in your state or national infrastructure and the human impact of your work.

To have the greatest impact, advocacy must have a few key components:

- 1. Collaboration** Plug the issue you are working on into a coalition. Whether it's connecting with survivors to bolster their stories or working alongside another organization to combine strengths and deliver a more complete picture, collaboration lends credibility and depth to an advocacy approach.

2.

Human Stories Legislators are people, too, and that means they will automatically look for the personal connection and emotional response they have to what you are presenting. Finding the right example and adding a human face and story to your approach will carry the data you are working to present much farther than simple cold facts. (It should be noted here that first-hand stories are far more effective than hearsay.)

3.

Good Research There is no substitute for accredited, verified, relevant, up-to-date research when advocating on an issue. Establishing that you have not only considered the facts of your presentation, but also can provide shareable data and statistical research for further reading provides a strong argument that also allows representatives to “see for themselves” why it matters. Research can be a launching point for further discussion with a legislator and can often open the door to further collaboration with your statehouse.

Legislative advocacy can take many forms. Perhaps your strong suit is education and training, in which case you can present at coalition meetings in your field and create a conversation with new data findings that will guide and impact the work of the group. Sometimes, the lens and encouragement found in data can be the catalyst for action. One thing I have learned from my leadership within various nonprofit organizations is the value of a network that lends diverse experience to the team. Passionate teams can move mountains, and there is no shortage of need in your community for whatever your strength is.

If your engagement style is more direct, you can connect with your state and congressional

representatives. As their constituent, your voice is important to them. Anyone can write or call their representatives about an issue of importance, especially if it pertains to current legislation. Sometimes, doing so leads to a request to provide input or testimony on a bill.

Other colleagues of mine prefer a hybrid approach, connecting with like-minded groups working on an issue and providing them with analysis and leadership from their field, occasionally joining lobby visits, legislative calls, or sending written testimony. Our democratic government is very accessible, and speaking with its representation is often overlooked as an avenue for change.

As a direct advocate, I encourage you to connect with your statehouse as much as possible. Bills are easily tracked online, and your representatives are more available for meetings and phone calls. I especially urge you to use your analytic expertise and experience to testify on bills that center on your issue of choice early and often. Testimony is what alters the course of legislation. It allows for crucial changes to be made to language, adds or removes stipulations, and can be the push that kills or boosts a bill in committee. Moreover, it creates a record.

Your words and data-driven statistical summary shared with your legislators in testimony can create a stepping stone for those who testify later, a pivot in conversation, and oftentimes a voice that has not yet been heard on the issue. Again, your legislators are human and are not experts on everything. Legislation is created with the hope and understanding that leaders in the field and those with experience in the area will give their input to guide the process.

Last, I encourage Data for Good statistician-advocates to look for coalitions and leaders around their issues in their communities. Often led by volunteers and nonprofits, these organizations and groups need a variety of expertise around the table, help finding and accessing good data, and support to interpret research. You may be surprised at the grassroots efforts in your region already working for change and waiting for your voice to help make a difference! ■

SWB Volunteers Share Experiences, Rewards

Matt Brems, Marketing and Communications Director, Statistics Without Borders



Matt Brems is a managing partner at the consultancy BetaVector, a member of the distinguished faculty at General Assembly, and the marketing and communications director for Statistics Without Borders. He earned his bachelor's degree from Franklin College and his master's degree from The Ohio State University.

In “Statistics Without Borders: Professionals Using Statistics and Data for Social Good” (Page 24 of this issue), you learned about Statistics Without Borders (SWB) as an organization. You learned who we are, what we do, and how we operate.

One consistent theme from that article was how much we are driven by volunteers. Operating with a zero-dollar annual budget, our 1,600+ volunteers enable us to have the global impact we have.

Whether you're looking at survey sampling, ensemble modeling, or properties of estimators, a larger sample is (usually) better than a smaller one. We may be dipping into some anecdotal evidence here, but our volunteers can describe a well-rounded SWB experience, and so we asked them to describe their experiences.

Matt Brems: Hello! Thanks for chatting with me. I'd love to hear about your experiences volunteering with Statistics Without Borders, but first—to get a sense of what folks are up to these days—what is your current job title?

Stephen Godfrey: I'm a technical product manager.

Smita Skrivaneck: I'm the analytics director for my company.

Jennifer Sniadecki: I am a director, statistical programming.

Raymond Majengo: I am a senior strategic information officer.

Qingyuan Wang: I'm a data scientist.

Mohammed Ali: I'm a software engineer.

Harold Otoh: And I'm an assistant revenue officer.

Matt: It seems like there's a lot of different skill sets that you bring to Statistics Without Borders. It would be helpful to hear about your work within SWB. Can you describe the client you worked with and what the project was like?

Stephen: I worked on a project with Client-to-Consultant Bridge to create a minimum viable product that curates a near comprehensive national list of grants and other low-cost funding sources available to small businesses and nonprofits impacted by the COVID-19 crisis in the US.

Jennifer: The project I supported was for Food for Life Global (FFLG). Our team analyzed multiple data sources, including FFLG website traffic, PayPal donations, Twitter feed, Facebook data, and Google Analytics data. (Food for Life Global is a large food distribution organization, serving almost 2 million free vegan meals per day.)

Mohammed: My team worked on a project for Blue Ventures, a marine conservation organization.

Harold: I also worked on the Blue Ventures project!

Mohammed: We worked on a household survey that included assistance in data cleaning, exploratory data analysis, data visualization, sample weighting, and an analysis plan for simple model building. Blue Ventures' goal was to evaluate the social impact of their work in Madagascar.

Qingyuan: Our project was to utilize Twitter data to understand people's response to the COVID-19 pandemic. We first scraped

tweets, and then built models to predict whether or not that tweet was relevant. This project was completed for the Montgomery County Community Emergency Response Team in Maryland.

Raymond: I worked on a project for Petlanthropy, a pet adoption agency based in the United States. The client wanted to know what factors affected pet adoption, with the objective of increasing the number of pets adopted.

Matt: Now, Smita, you and I are “permanent” volunteers for SWB, so our work isn't directly focused on one specific project. Instead, can you describe your role and how it fits into the bigger picture?

Smita: I lead the operations directorate within SWB. (Statistics Without Borders has three directorates; the operations directorate builds processes and develops systems to make sure everything gets done as seamlessly as possible.) I've acquired and honed a lot of valuable skills, such as setting up and managing new platforms like SharePoint, communicating clearly with and being sensitive to the viewpoints of people from different cultures and backgrounds, and diplomatically handling disagreements among team members. The most rewarding part of this role is seeing how our team's efforts enable our incredibly talented volunteers to perform great work to help nonprofits do good for the world.

Matt: How about the rest of you? What did you think the most rewarding part of your role was?

Jennifer: Hands down, the gratitude expressed by the client is the most rewarding aspect. It is personally gratifying to receive



Stephen Godfrey



Smita Skrivaneek



Jennifer Sniadecki



Raymond Majengo



Qingyuan Wang



Mohammed Ali



Harold Otoh

heartfelt appreciation from the clients. And that client satisfaction feedback reinforces the direct impact the entire SWB organization is making.

Mohammed: The client feedback about my work, including my exploratory data analysis and model building, was very positive and encouraging.

Qingyuan: The most rewarding part of my work was when I found myself supporting my teammates and playing an important role in overseeing the data quality. Every time someone shared data, I would carefully explore the data and follow up for further clarification or correction of the data. Even though this job is not as fancy as model building, it is the most fundamental part of the project, so I feel very rewarded for taking on this responsibility.

Stephen: As our country initially responded to one of the most dramatic economic shocks in its history—the disruption precipitated by the COVID-19 pandemic—I, like others, wanted to help my fellow citizens and make a small contribution to restoring some stability. While I expected that contribution to be small, I was hopeful that there was a way to scale it to have a broader impact. This SWB-C2CB project provided such an opportunity by thoughtfully using data-management tools to leverage our work and help a much larger audience of small businesses than would otherwise have been possible.

Matt: What about challenges? What did you think the most challenging part of the job was?

Raymond: Being able to work remotely with different people who don't possess the same professional background, experience, or ethnicity. But being united with a common goal of serving society, we were able to adjust to a good working environment for all of us.

Smita: Coordinating work among team members who, at one point, spanned four different continents!

Mohammed: Two things. First, the data set was wide and we had to split it by related features and topics. Second, there weren't many observations, so we had to be careful about our analysis.

Stephen: In my view, the most challenging part of this project was finding a “viable” minimum viable product in the short two-week timeline. As you can imagine, pulling data from a wide range of sources, organizing those diverse data elements, and finding a way to present to small-business owners in a useful and focused way is a challenge. Still, the team was able to find a solution.

Qingyuan: The most challenging part was to figure out the exact format of the end product, especially as the project moved forward. Our original plan was revised, so it was a bit frustrating to give up on what I had done and start in a new direction. However, after discussing

with the team and getting more data and clarification from the client, we were able to build the end product.

Jennifer: This project called for a deep dive into Twitter data. Not having a breadth of experience in pre-processing text data was a bit of a challenge. However, this need translated into an opportunity to expand my personal skillset. Using real-world data to refine your skills and learn new techniques, all while providing your client with actionable results, is one of the many benefits of volunteering with SWB.

Matt: Wrapping up, is there anything else you'd like to share about your experiences?

Mohammed: It was very enjoyable and informative to work with a team that has different experiences in different areas to help people in Africa. It is a win-win from every aspect. Thanks for such great opportunities!

Raymond: I am glad that I have served SWB in different capacities such as being a volunteer, being a [project and client manager] ... I worked with a fantastic community and learned a lot from them. Being [in my] 20s and being in Africa, SWB has provided me with an eye-opening experience and opportunities around the globe and in my professional life. I owe a lot of my career development to SWB and yet I am happy I am part of a big community that serves the world. ■

Editor's Note: Some of the exchanges have been edited for clarity and readability. (Context by the author may be added in parentheses.)

MORE ONLINE

Check out our other article, “Statistics Without Borders: Professionals Using Statistics and Data for Social Good,” beginning on Page 24 of this issue, or head to our website at <https://statisticswithoutborders.org>.

StatCom at Purdue University: How We Do Good

Andrew M. Thomas, StatCom Purdue

The number of ways in which data can be analyzed and leveraged to produce good for communities is manifold. One way in which these insights are delivered is via some form of statistical consulting center, located within a university, which aims to serve those at the university and/or in the surrounding community.

An instance of statistical consulting is the organization StatCom (Statistics in the Community). This organization is a decentralized network of university chapters that provides free statistical consulting services to local governments and other nonprofits. Some StatCom chapters also offer P–12 (preschool–12th grade) elements.

Founded at Purdue in 2001 by then-statistics graduate student Nels Grevstad and staff member Regina Becker, the number of StatCom chapters rose to 14 worldwide by 2013 and many of these continue to survive and thrive today.

Not only does StatCom offer the consulting services for community partners, but student volunteers have the opportunity to engage in meaningful service-learning opportunities. Importantly, this organization provides emerging scholars a chance to improve their ability to communicate statistical results to nonstatisticians and apply knowledge they've acquired throughout their coursework and studies.

Case Studies: Data for Public Good

From fall of 2018 to early spring of 2019, StatCom Purdue (www.stat.purdue.edu/external_relations/statcom/index.html) worked with the nonprofit Certell, which provides free full-semester curriculum for high-school social studies, to help them understand data collected from the online platforms through which their content is offered. StatCom created visualizations to show how users engaged with their eReader platform during the 2017–2018 school year by social studies subject and US state. The team also investigated the video viewing behavior of students and teachers. They found that the proportion of the video they watched was significantly different, but the proportion of the

video watched followed a bimodal distribution for each group—they either watched a few seconds or the entire thing.

The team for this project consisted of three members, one of which was the team leader and main point of contact for the nonprofit. A report was produced and presented to Certell, which included all the analyses and additional questions their data team could investigate in the future. Team member Chuanhui Liu writes the following:



Chuanhui Liu

I learned from the Certell project that it's a win-win for both of us: local [non-profit] businesses get free consulting advice and consultants get their hands dirty and are challenged to solve real-life problems. Although we [as] students are not experts in the online education

industry, we listened to our client's questions and concerns, tried our best at digging [out] valuable information from raw data, and presented our results in plain words.

In the spring of 2020, a team of three StatCom Purdue volunteers conducted a study on donation patterns for a local nonprofit, LTHC Homeless Services. Notably, the team noticed a large spike in donations in April 2020, as Indiana was in the middle of lockdown for the COVID-19 pandemic. Team leader for the project, David Arthur, had the following to say:

In our most recent project with LTHC Homeless Services, we were able to use donations data to better understand donation patterns over the last



David Arthur

four years. Donations are the lifeblood for organizations like LTHC, and so understanding important questions regarding donations was very important. We were able to use their data to help them answer several questions regarding donors and their donation patterns. Some of these questions included, “How often do people donate?” “Who are the most consistent donors?” and “Who are potential future donors?” By helping LTHC use their data to glean insights into these questions, we were able to help them better understand their donors, which will in turn help them to strengthen their relationship with them, which will ultimately lead to more help and resources for those experiencing homelessness.

An important aspect of StatCom is the accessibility of the analysis to nonstatisticians. In both of these projects, nothing more advanced than a t -test was performed. In fact, the main focus of StatCom, at least at Purdue, has been designing and analyzing surveys, as well as summarizing and visualizing data. This suggests data for public good initiatives often need to go no further than summary. Helping community organizations understand their population of interest, collect relevant data, or understand data they already possess can have as much impact as advanced statistical methods, and in some cases, an even greater impact.

Data for Public Fun

StatCom Purdue also regularly engages with the community via P–12 outreach. In recent years, this has involved staffing a booth at Purdue homecoming and SpringFest and playing games with a statistical component to increase statistical literacy, advertise StatCom to community members, and simply have fun. Unlike many of the consulting projects, a number of undergraduate volunteers participated at these outreach events, helping track data in the interactive R Shiny apps that were developed,

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giving out candy to winners (everybody), and assisting in playing games.

At SpringFest 2019, as an homage to the tagline for Purdue’s 150th anniversary, attendees were encouraged to don an astronaut helmet and take a “Giant Leap.” Their heights and ages (with a few exceptions) were measured, and then their jump length was plotted against these quantities for everyone to see. Participants were also encouraged to guess the diameter of the Big Bass Drum of Purdue’s marching band and the height of the Purdue bell tower. The former demonstrated the concepts of correlation and regression, and the latter demonstrated the concept of an outlier—someone guessed the drum’s diameter to be 6,400 feet (the real figure is around 8 feet). Later, at homecoming, attendees were invited to play Craps Jr. to demonstrate the law of large numbers.

Taken together, these activities represent a small fraction of the work StatCom chapters across the country have taken part in to make a tangible impact on their communities. For almost 20 years, the Purdue chapter has thrived, producing reports and analyses for cornerstones of the community. Through StatCom, early-career statisticians learn to lead, collaborate, communicate, and put into practice their acquired knowledge for the good of society. ■

Advocating for the Federal Data Infrastructure: What, Why, When, and How

Daniel Elchert, ASA Science Policy Fellow

Statistics can be described as the science of learning from data and of measuring, controlling, and communicating uncertainty. In practice, a statistician collects and analyzes information using a particular approach to make good inferences in response to some question. Sound data collection and analysis, in turn, help drive decisions supported by evidence.

Foundational to the practice of statistics, and as I believe to democracy writ large, is an objective, trustworthy, and independent federal data infrastructure, or a publicly financed system of statistical agencies that inform the public on topics such as labor, health, education, agriculture, housing, finance, and transportation. But what is our federal data infrastructure, exactly? And when and how might statisticians go about advocating for this system as a means to leverage data for the public good?

The Data Infrastructure

In the United States, statisticians were among the first scientists to go about establishing a profession. It was 1839 when the newly formed American Statistical Association was given the task of “collecting, preserving, and diffusing statistical information,” according to R. L. Mason, J. D. McKenzie, and S. J. Ruberg in *The American Statistician* article, “A Brief History of the American Statistical Association, 1839–1989.” Using their unique statistical skills, ASA members soon

began proposing reforms to the upcoming 1850 census.

These and other early interactions with the federal government signified a burgeoning social contract between American statisticians and the nascent republic’s citizenry; statisticians were seen as experts of their domain and, in turn, entrusted to collect, analyze, and report official data in agriculture, commerce, education, and health.

A federal data infrastructure would slowly emerge and expand, today comprising a large, decentralized network of agencies, units, and programs. Thirteen of these agencies are known as principal federal statistical agencies, the largest of which by budget are typically the Census Bureau, Bureau of Labor Statistics, National Center for Education Statistics, and National Agricultural Statistics Service. By statute, the director of the Office of Management and Budget (OMB) coordinates this system, but the chief statistician of the United States carries out its functions to ensure the efficiency, effectiveness, and integrity of information collected for statistical purposes.

What and Why to Advocate?

In the 21st century, statistical science is a broad and expanding profession that continues to be guided by an implicit contract with the public. An objective, trustworthy, and independent data infrastructure helps our

discipline fulfill this obligation to serve the public good, but its mere existence does not meet this burden. For data to be used for the public good, statisticians should advocate for this infrastructure to help address its new and longstanding challenges.

Consider the surprise 2018 geographic relocation of the Economic Research Service from Washington, DC, to Kansas City, Missouri, which badly damaged the agency’s workforce and led to a robust debate about the purported political reasons for such a change in locale. Or the administration’s effort to add a citizenship question to the ongoing 2020 census, despite a disapproving outcry from myriad scientists and citizens who feared degradation of quality and potential politicization of the nation’s only constitutionally mandated survey. The Supreme Court ruled the stated reason to include such a question was “contrived,” but widespread controversy arguably damaged the data infrastructure, which endeavors to be apolitical and dictated by science.

Even today, efforts remain to compile data on citizenship using information initially collected for regulatory or other administrative purposes, further fraying the public’s trust in government statistical agencies.

These and other events make clear the need for scientists to advocate for the integrity of statistical agencies so they operate according to best practices, such as those defined by the

National Academy of Sciences (NAS) and OMB.

The National Academies' *Principles and Practices for a Federal Statistical Agency* (6th ed.) and OMB's Statistical Policy Directive #1 offer insight about the values statisticians' advocacy efforts should emphasize. Trustworthiness, objectivity, non-partisanship, relevance, and timeliness, to name just a few, should drive our data-related advocacy efforts, as should principles summarized in the United Nations Statistics Division's Fundamental Principles of Official Statistics.

The ASA's own Ethical Guidelines for Statistical Practice describe a collective "responsibility to the public," and I think good stewardship of this commitment is reflected in advocacy that comports with these values. When should such advocacy occur? What exactly does advocacy look like in practice?

When and How to Advocate?

In April 2017, the ASA Board of Directors discussed criteria to inform when the association should make an official statement. After a thoughtful and prolonged deliberation, the board identified the following five criteria:

Does the issue impact the statistics profession or the ASA itself?

Does this issue impact the quality or integrity of science or the ability to inform public policy?

Does the issue provide an opportunity to educate the public about statistics or the statistical aspects involved in this issue?

In our judgment, would our members expect us to be involved in the issue?

Does the issue relate to possible infringement on scientific freedom or human/civil rights?

These questions are by no means exhaustive, but they provide guideposts for when the ASA should speak out on some issue. In addition, these questions can help inform individual statisticians about when to speak out so data is used to advance the public welfare.

To advocate for our data infrastructure, statisticians can get involved in professional associations including the ASA, such as through volunteering with a committee, participating in relevant sections, or joining with student affiliate groups. Additionally, statisticians can join or follow organizations like the Council of Professional Associations on Federal Statistics (<https://copafs.org>), the Association of Public Data Users (www.apdu.org), and the Data Coalition (www.datacoalition.org) to receive updates about federal statistics via listservs, webinars, or policy briefs.

Signing up for updates about implementation of the Federal Data Strategy (<https://strategy.data.gov>), which is the government's ongoing effort to leverage data as a strategic asset, is another important way to stay engaged with changes to our data infrastructure.

The ASA's own Count on Stats (www.amstat.org/ASA/Science-Policy-and-Advocacy/Count-on-Stats.aspx) public relations campaign, which aims to increase public trust in federal statistical agencies, also provides regular information through its newsletter, members only LinkedIn group, and Twitter feeds.

Statisticians who are interested in promoting the integrity of official statistics should also follow the International Statistical Institute (www.isi-web.org) and its global network of associations working to apply "statistical science for a better world."

Professional associations also sponsor advocacy opportunities, such as the ASA's recent member-driven initiative about staffing and budget problems at the National Center for Education Statistics.

On an individual basis, constituents can request to meet with their elected official to advocate support for statistical agencies

Precision Medicine Workshop

The 2020 Precision Medicine Workshop, presented October 8, will bring in two world-recognized experts, Haoda Fu and Michael Kosorok, to present their research with the goal of translating precision medicine into improvements in health care across the clinical and translational spectrum. This workshop will be broken into two parts, an AM and PM session, focusing on different aspects of precision medicine and emerging technology. The workshop is open to all and is free. <https://gpctr.unmc.edu/training-education/precision-medicine-workshop-2020>

Further Reading

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United Nations Statistics Division Fundamental Principles of Official Statistics, <https://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx>.

and highlight society's collective need for the objective, nonpartisan data collection and analysis services statisticians provide. Statisticians who meet or communicate with their public representatives should educate themselves about proposed policy changes that have widespread support by the broader scientific community, such as those highlighted by the bipartisan Commission on Evidence-Based Policymaking.

Another way to get involved is by using statistical skills to analyze proposed regulations relevant to statistical science, which are frequently published in the *Federal Register*, the government's official vehicle for

seeking public comment. As an example, the ASA's Committee on Scientific and Public Affairs Advisory Committee recently responded to a *Federal Register* notice about proposals to alter the nation's poverty measure, developed by the statistician and economist Mollie Orshansky.

Advocacy efforts are enhanced through coalition building, so statisticians should ideally collaborate with a diverse set of colleagues to ensure messaging is clear, consistent, and aligned with best practices. Each of these approaches offers ways ASA members can advocate for our data infrastructure to promote the use of data for the public good.

What You Can Do Now

To most effectively use data for the public good, society needs a strong, trustworthy, and objective federal data infrastructure. By engaging in ethical and nonpartisan advocacy, statisticians can demonstrate shared commitment to our social contract, which dates to at least the mid-19th century in the United States.

Leaders from our data infrastructure, including Katherine Wallman, former chief statistician of the United States; Charlie Rothwell, past director of the National Center for Health Statistics; and Steve Landefeld, previous director of the Bureau of Economic Analysis, have described many of the challenges that need to be addressed through advocacy and, ultimately, policy change. Among others, these include instances of political interference, depreciating top-line budgets, diminished autonomy and authority, stagnant hiring practices, aging technology and equipment, and technical problems like declining survey response rates.

Expert statisticians across federal and state governments are to be commended for continuing to deliver the high-quality data collection, analysis, and reporting services we need, but their success is driven by skill and a personal commitment to use data for the public good. The broader statistical community must continue to champion their essential work and our need for a federal statistical system that reflects best practices. Advocating for our federal data infrastructure offers one way to help ensure that publicly financed data collection, analysis, and reporting activities are positioned to increase the role of evidence-based policymaking. ■

Q&A

We interviewed three statisticians who strive to change the world through data. We asked them who inspired them, why they became statisticians, and how data science is changing the world.

What do you love about statistics/data science?

For me, the answer is twofold. Data science is more or less a mix of statistics and coding, each of which I love for different reasons. I love statistics because, while it can easily be manipulated and reported falsely, it's the most direct path to honesty when used correctly. People can say whatever they want in news articles and research papers, but if you have access to the data and can run the numbers yourself, you have the power to share the truth. On the other hand, I love coding because it's almost like a game. Getting the code to do what you want it to do is rarely straightforward, and you have to be creative and patient to figure out how to make it work. It's like a logic puzzle, but with hundreds of possible solutions. As a result, data science is both a source of fun and power, and I really don't think there's a better combination than that.

What did you find to be the most exciting part of mentoring students in the Indiana Emergency Medical Services Association partnership in The Data Mine this year?

It was an incredible experience to know that the sole purpose of our work was to improve the lives of EMTs in Indiana. There were no business plots, no political incentives. We were simply trying to help people. And along the way, we all learned a lot. There was so much we didn't know about EMTs before we began, and it was just such an interesting and complex topic for the students to research.

What did you find to be the most challenging part of mentoring students?

Due to the unique organization of our specific research group, I—along with another TA in The Data Mine—were more or less in charge of directing the group of students and leading the research. Saying I felt entirely unprepared would be an understatement. While I had participated in research before, I only had experience working one-on-one with a professor, so I had no idea how research should function among a group of people. I had to completely rewire my thought process and approach to research, while also figuring out how to lead a research project (which I had never done before) on a topic I previously knew nothing about. It was very much one of those situations in which you dive straight into the deep end, but I had so much support from Mark Ward and Ellen Gundlach. I wouldn't have managed without their guidance.

Tell us one way data science is changing the world.

Just one way? How about a fun one? Data science can and has been used to predict how busy amusement parks like Disney World and Universal Studios are on any given day. By tracking the number of people inside a park and wait times at individual rides throughout the day every day for multiple years, it's possible to predict with relative confidence what days are best to visit and even what route through the park will get you on the most rides with the least amount of wait time.

Sure, that's not exactly changing the world, but it sure does make your vacation a lot more fun.

How has data improved your life?

Is there any way it hasn't? Data is everywhere, and it affects every decision. Heck, data helped create the data science initiative at Purdue, and not just because there are limitless amounts of data to be analyzed. Data on programs at other universities, data on career potential and growth, pricing data—it all played a part in starting the data science initiative at Purdue, which has led to the creation of the data science major and The Data Mine.

What are three pieces of advice you would offer your past self?

Don't be afraid of taking opportunities. The worst thing that could happen is you're told no, and a two-letter word is nothing to be afraid of.

It's okay if you don't know everything. Even when you have a BS and a full-time job, Google will still be your best friend. Honestly, if you think you know everything, that's the real cause for concern.

Take a dance class. They're fun. They're easy. And it turns out it's actually true that being active improves your overall academics. Who knew? ■



HOPE CULLERS

Research Data Analyst
Institutional Data
Analytics + Assessment
(IDA+A)

Participated in The Data Mine: Advancing data science for undergraduates through collaboration, learning, research, innovation, and entrepreneurship

MORE ONLINE

Read more about Hope Cullers at <https://magazine.amstat.org>.



CRYSTAL GRANT

Congressional Science and
Technology Policy Fellow

What do you love about statistics/data science?

When I look back at my PhD, the times I felt most inspired were when I was working with data. I took my first programming class in my first year. We had two months to do a project in R but I was so excited about it, I stayed up and did it all the night after we'd gotten the data! It was in that class I realized that, without data and rigorously applied statistical methods, we cannot generate new facts, we cannot advance knowledge or create truths. I realized then that science is wholly dependent on statistics. It began my love of statistics and data (and prompted my falling a little out of love with biology). I believe the insights we can glean from data can be used to improve many aspects of society and that socially conscious and ethical data scientists and technologies are needed to help correct existing biases in tech and make statistics a tool for social justice.

Tell us one way you want to use data science to change the world?

There are many ways I'd like to use data science to change the world, but the most pressing was expressed in a recent Bloomberg Opinion piece by Cathy O'Neil,

the author of *Weapons of Math Destruction*. In her piece, she suggests repurposing algorithms used to determine someone's risk of committing a crime (though predicting such a thing is impossible) to instead better understand the sociological factors and structures that coincide with increased risk of being charged with a crime. Rather than using this data to try to predict the future, it needs to be used to fix the present. Many algorithms, whether in banking, health, or criminal justice, are pointing to the same risk factors in predicting worse outcomes and making it clear racism, poverty, and discrimination are the root cause for differences between people. Until the social structures and racial injustices leading to the training data being biased are addressed, the data and all algorithms generated from it are useless.

How has data improved your life?

I easily become enveloped in, maybe obsessed with is more accurate, whatever coding project I am working on at the time. Learning new skills, techniques, and languages has become something I can't imagine not doing in my future career. I am excited about data science because, when I'm working with data, I'm at my most mentally engaged and feel my most creative. It sounds nerdy but I didn't understand the concept of flow until my second semester of intro computer science. I started a project at 8 p.m. and finished it at 8 a.m. the next day. I realized I'd been so engrossed, I'd forgotten to eat or sleep—that feeling is priceless.

Name three people you find the most fascinating and tell us why.

Seth Stephens-Davidowitz is a data scientist and author of *Everybody Lies*. I found his book so fascinating and think that Google trends is an incredibly

powerful data set and reference to better understand and predict American behavior and opinions. I think all of his analyses were really inventive and eye-opening (a little disheartening).

Ruha Benjamin is a sociologist and author of *Race After Technology*. I find her focus on data being used to automate racial bias and, in health care, automate eugenics as fascinating as it is terrifying. Hearing her speak about the relationship between race and technology is captivating, and I'm so grateful she's shining a light on the issue.

Fatimah Nyeema Warner, aka Noname, is an incredibly talented female rapper who created an international book club to educate herself and others about topics in sexuality, race, criminal justice, capitalism, and more. I ascribe to her level of authenticity, open-mindedness, and self-reflection.

What are three pieces of advice you would offer your past self?

Speak up more. Women are socialized to be likeable and not ruffle feathers. I let go of this in graduate school but wish I could've let it go much sooner—some feathers need to be ruffled.

Don't be too intimidated to learn how to code. People who look like you are capable of coding; it's not only for people who look like a cast member of "The Big Bang Theory."

Read more books by black women: Morrison, Davis, Hooks, Giovanni. I discovered all of them so late, though better late than never. ■



SMITA SKRIVANEK
Operations Director, Statistics
Without Borders

Tell us about Statistics Without Borders.

An outreach arm of the American Statistical Association (ASA), Statistics Without Borders (SWB) is a volunteer-only group providing pro bono services in statistics and data science to nonprofits, NGOs, and governmental agencies. Its goal is to improve decision-making and promote public benefit through the proper application of statistical principles and best practices, especially where access to such resources is limited. Membership in SWB is free and available to all, regardless of where in the world you reside. You do not have to be a member of the ASA to be a member of SWB; all that is required is a keen interest in data-driven science and a passion for serving others.

What do you love about statistics/data science?

In the sense that data science (into which I include statistics, computer science, and other data disciplines) helps extract the meaning hidden in complex data, it is like knowing a foreign language—the data will reveal their secrets if you “speak the language” (i.e., if you frame your questions well and apply them skillfully through code and analysis). It is the most exhilarating feeling to approach a data set not

knowing what you may find and ending with an insight that illuminates the crux of the problem. What’s not to love?!

What are the top three skills you need to be part of Statistics Without Borders?

Passion. You care about good science and want to make a positive impact on the world through the causes SWB serves.

Commitment. While you get to set your own volunteering limits, you can be depended on to see your commitments through.

Curiosity. You have a strong desire to learn about the issues SWB’s clients are involved with, and the motivation to drive deeper understanding of these issues.

While data skills are definitely a plus for an SWB member, we have plenty of positions available for non-data experts who are interested in becoming involved, such as client/volunteer management, marketing and communications, and operations, so don’t let a lack of programming expertise or being a student/retiree hold you back!

How has data improved your life?

Of course, we all know how data is applicable to almost all facets of today’s world. My life is no exception, with data figuring heavily in my daily choices, from self-tracking various personal health and financial measures to determining how much screen time is optimal (for me) to improving how I do my job. I’ve estimated my carbon footprint (www.nature.org/en-us/get-involved/how-to-help/carbon-footprint-calculator) by collecting data on my home, transportation, diet, and activities and realize I have a way to go to get it down below 2 tons per year, but at least I now have visibility to the problem—and the solutions!

Name three people you find the most fascinating and tell us why.

Greta Thunberg: The teenage climate activist, for overcoming her utter distaste of public attention to capture the world’s imagination with her historic UN address on the urgency of the climate issue and for fearlessly speaking truth to power.

Wangari Maathai: For her unswerving commitment to social justice and environmental causes throughout her life in the face of gender and tribal discrimination and formidable political opposition. Her book, *Replenishing the Earth: Spiritual Values for Healing Ourselves and the World*, is an impassioned call to environmental volunteerism and her final piece of advice, a credo to live by: “Look at the problem in front of you and try to solve it. Don’t peer too far down the road and ask, ‘What can I do then?’ for you risk being overwhelmed. I firmly believe that most problems we encounter have a solution. Although a day may arrive when you come across a problem you cannot address, most of them you will be able to make a contribution to solving.”

Dr. Anthony Fauci: For persevering through all odds during the COVID-19 pandemic to champion science-based policy-making. His calm dissemination of the facts, measured pragmatism, and absolute refusal to engage in petty politics does the scientific community proud. ■

Professional Opportunity listings may not exceed 65 words, plus equal opportunity information. The deadline for their receipt is the 20th of the month two months prior to when the ad is to be published (e.g., May 20 for the July issue). Ads will be published in the next available issue following receipt.

Listings are shown alphabetically by state, followed by international listings. Vacancy listings may include the institutional name and address or be identified by number, as desired.

Professional Opportunities vacancies also will be published on the ASA's website (www.amstat.org). Vacancy listings will appear on the website for the entire calendar month. Ads may not be placed for publication in the magazine only; all ads will be published both electronically and in print.

These listings and additional information about the 65-word ads can be found at ww2.amstat.org/ads.

Employers are expected to acknowledge all responses resulting from publication of their ads. Personnel advertising is accepted with the understanding that the advertiser does not discriminate among applicants on the basis of race, sex, religion, age, color, national origin, handicap, or sexual orientation.

Also, look for job ads on the ASA website at <https://jobs.amstat.org/jobseekers>.

Texas

■ Rice University, One full-time, 12-month postdoctoral fellow position (with renewal given continued service) at the Statistics Department at Rice University. Requirements: PhD degree in Statistics, applied mathematics, computer science, or a related field; experience in R and Python; statistical analysis methodology such as regression, multilevel models, and Bayesian methods. See full description and apply at Rice job website - <https://jobs.rice.edu/postings/24015>. EOE

CANADA

Ontario

■ The Institute of Health Policy, Management and Evaluation in the Dalla Lana School of Public Health at the University of Toronto invites applications for a full-time tenure stream faculty position in Outcomes and Evaluation Methods (Job# 2000932) at the rank of Assistant Professor, beginning January 1, 2021, or shortly thereafter. If you have questions about this position, please contact ihpme.director@utoronto.ca. To apply: <https://utoronto.taleo.net/careersection/10050/jobdetail.fnl?job=2000932&tz=GMT-04%3A00&tzname=America%2FToronto>. EOE ■



Statistical Career Opportunities

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SOCIAL CHATTER

We asked our followers what statistics book they recently finished or planned to read soon.

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Caleb King • @ckingstats

These aren't solely on stats but they're still great in my opinion! One is a cautiously optimistic look into the future while the other a fun yet insightful romp through math/statistics blunders of the past and present. Great works by @standupmaths and @FryRsquared



Jon Labahn, Jr. • @JLabahnJr

This my third time through this book, given my current 'prodigious' Twitter interaction...it's going /glacially/ slowly! (In all honesty...not particularly strongly focused on stati[st]ics at all, but, occasionally readers will see the benefit.)

Leslie McClure •

@StatGirlLAM

We're doing a departmental book club on "Weapons of Math Destruction." Can't wait!

Great Women of Mathematics •

@GWOMaths

Naked Statistics, by Charles Whelan.

Anthony Cutler •

@anthonyncutler

Diaconis & Skyrmes - Ten Great Ideas about Chance - recently read for the first time but I will perhaps wnever "finish" it.

Kel Zou • @kel_zou

During the pandemic, "Bayesian Statistics the Fun Way: Understanding Statistics and Probability with Star War[s], LEGO, and Rub[b]er Ducks," besides [N]efflix!

For more reading suggestions, visit @AmstatNews at <https://twitter.com/AmstatNews>.



Your research makes a difference.

In these challenging times, we are humbled to see how researchers are using Stata to analyze data in the global fight against COVID-19.

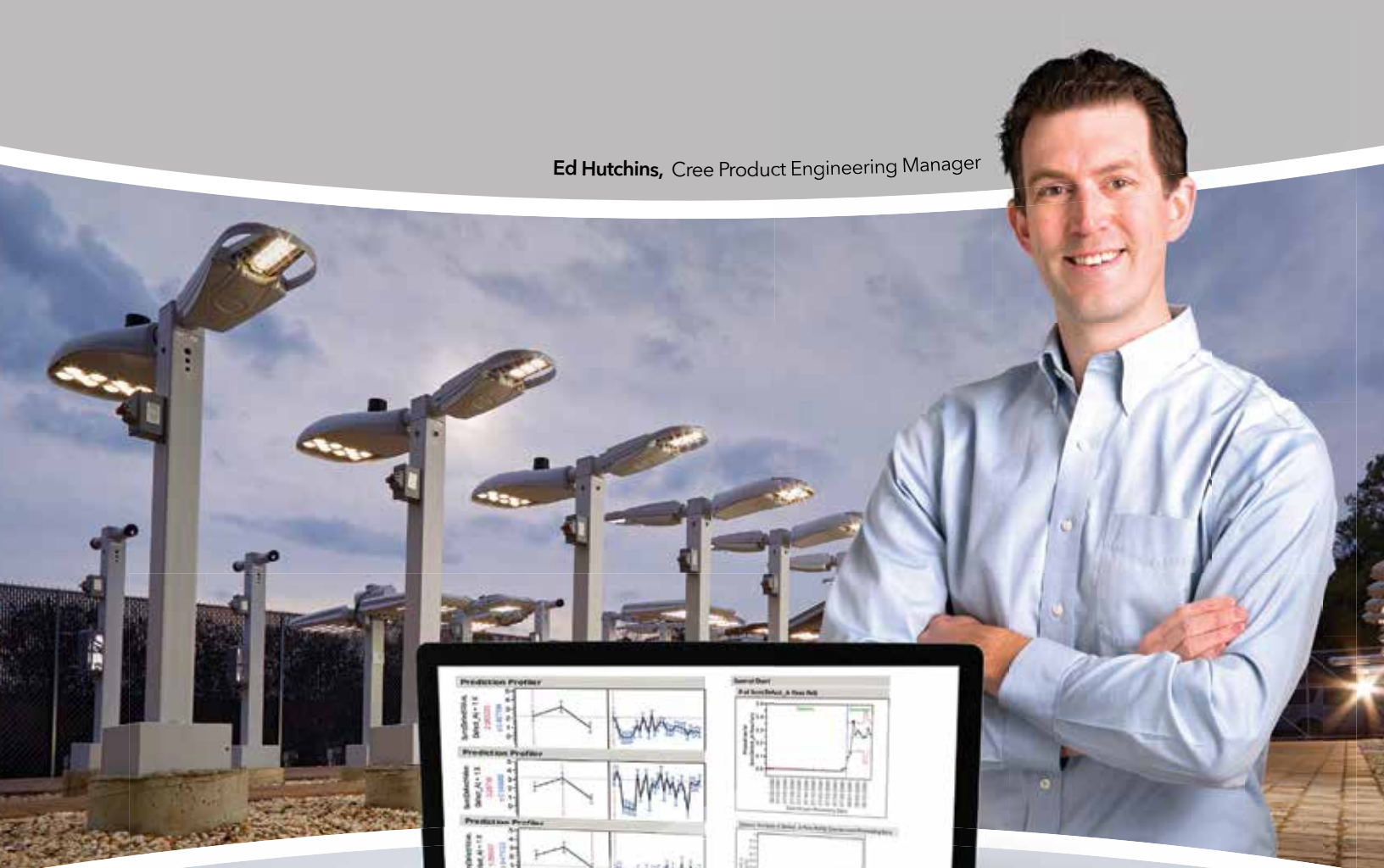
stata.com/amstat-cv19

Find out how →

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Ed Hutchins, Cree Product Engineering Manager



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