AMSTATNEWS

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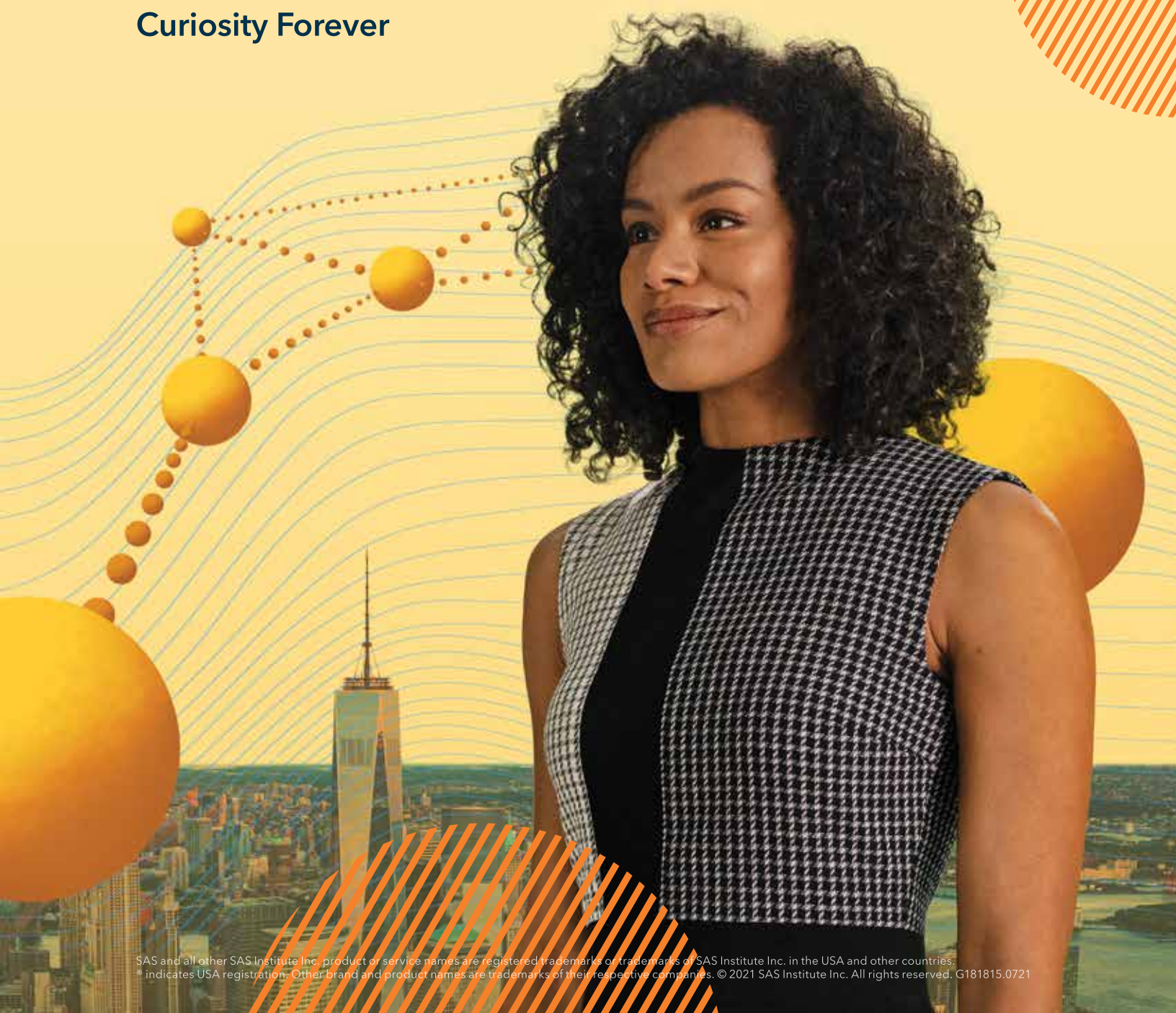**and the Science of**
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AMSTAT**NEWS**

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Amstat News welcomes news items and letters from readers on matters of interest to the association and the profession. Address correspondence to Managing Editor, *Amstat News,* American Statistical Association, 732 North Washington Street, Alexandria VA 22314-1943 USA, or email *amstat@ amstat.org*. Items must be received by the first day of the preceding month to ensure appearance in the next issue (for example, June 1 for the July issue). Material can be sent as a Microsoft Word document, PDF, or within an email. Articles will be edited for space. Accompanying artwork will be accepted in graphics file formats only (.jpg, etc.), minimum 300 dpi. No material in WordPerfect will be accepted.

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.

INFLUENTIAL

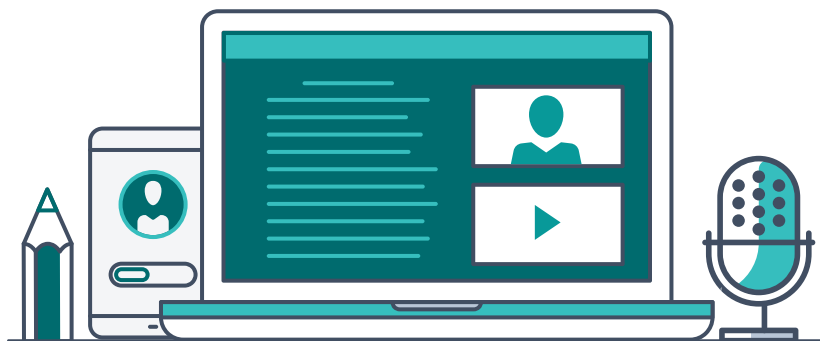# COMMUNICATION IN STATISTICS

COMMUNICATION TIPS

But Wait …
There's More!

ASA members have been on the front line of the **COVID-19 pandemic**, witnessing emerging innovations and adopting new technology. Read about some of our members' contributions in **"Surveys, Dashboards, and Innovations in Response to COVID-19"** at *https://magazine.amstat.org.*

Don't Miss These Upcoming Events

The 28th meeting of the **Biopharmaceutical Applied Statistics Symposium (BASS XXVIII) will be held virtually October 25–28.** ASA Executive Director Ron Wasserstein will deliver the keynote address. Visit *www.bassconference.org* for details.

The ASA Biopharmaceutical Section Regulatory-Industry Statistics Workshop, to take place virtually September 21–24, will offer short courses, plenary and concurrent sessions, roundtable discussions, and posters. This year is particularly special because the workshop features the town hall, **"40 Years of the Biopharmaceutical Section: Celebrating Our Past, Planning for Our Future,"** in which six former section chairs discuss not only the inception and tremendous growth of the ASA's largest section, but also how it will continue to lead the way in addressing the challenges of medical product development in the 21st century. To catch a preview, listen to Richard Zink's interview with workshop co-chairs Bo Huang and Gene Pennello in the latest Biopharm podcast at *https://community.amstat.org/biop/media-contents/podcasts.*

COLUMNS

STAT*tr@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.*

This column is written for those interested in learning about the world of Data for Good, where statistical analysis is dedicated to good causes that benefit our lives, our communities, and our world. Ift you would like to know more or have ideas for articles, contact David Corliss at *davidjcorliss@peace-work.org.*

Q&A

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Evolving Culture Through JEDI Principles: What Is Your Portal?

Greetings, fellow statisticians. Summer is coming to an end, and, for many, a new academic year is beginning. Alas, the delta variant remains with us. Please be careful, mask up, and get your booster shot (or get vaccinated if you haven't yet done so). We need you!

I had not anticipated writing a September President's Corner column, but I am grateful to have the opportunity to again share my thoughts. We are post-JSM, and I thank all for their participation. I immensely enjoyed taping my presidential address and hope my message about the role of self in statistics resonated with you. I was gobsmacked by Vivienne Ming's insightful and inspiring president's invited address on messy human problems. For those interested, both presentations should be available for viewing in the near future on the JSM website.

As I write this, I am hours away from giving a presentation to the ASA's JEDI Outreach Group at their inaugural general body meeting. The Justice, Equity, Diversity, and Inclusion (JEDI) Outreach Group is a community of statisticians and data scientists committed to communication, programming, and professional development that advances and supports a society valuing all people. We should all give thanks to former ASA president Karen Kafader for forming the JEDI group, Julia Sharp for her leadership in getting the group running, Kim Sellers for becoming the first JEDI group chair, and all who have contributed for making this group a reality. The JEDI group represents an exciting milestone in the ASA's history.

I pride myself in being a member of the JEDI group. The way I see it, we are all "JEDIs" at some level, since we all seek to advance and support a society that values all people (at least I hope we do). Like anything else, becoming a JEDI is not a dichotomy but a matter of degree. To me, being a JEDI is a developmental journey toward being the best professional/manager/researcher/human you can be. And the road traveled requires JEDI principles to guide you.

Santos (right), at age 5, stands with his sister wearing his favorite Davy Crockett T-shirt.

Photo/Steve Everett
Rob Santos

Everyone has a starting point for their JEDI journey. I like to think mine started around the time I was five years old. There is this picture of me standing with my sister in front of our bungalow in San Antonio, a three-bedroom home to all seven of us. I am wearing this holey Davy Crockett T-shirt and beaming with pride. That shirt—hole in the bottom not withstanding—was my most treasured possession. It featured a character from a TV show in the 1950s by the same name—*Davy Crockett*. The darn theme song still buzzes in my head when I view the picture: "Davy, Davy Crockett, king of the wild frontier …" By the way, please disregard that I forgot to don pants for the picture. I loved life and playing so much I typically would forget

> As a young professional, I became quickly aware that I needed to recognize my biases in both my professional and personal lives.

something in my eagerness to get outside and play with whatever was there—insects, cactus, rocks, sticks, neighbors, whatever.

The reason I see this as the starting point of my JEDI journey is because of what the Davy Crockett shirt symbolized: my assimilation into US culture as a second-generation Mexican American. Because both my parents worked, my pre-school days were spent at home with my grandmother listening to Spanish-language radio and music, but the afternoons and evenings were filled with the new technology of the time—black and white television. I was given 'full doses' of shows such as *Ozzie and Harriett, Lassie, The Rifleman*, and, yes, my favorite *Davy Crockett*. And I watched cartoons such as *Looney Tunes* and *Popeye*. Those shows communicated cultural norms and values I did not realize were having a profound impact on me.

For instance, many of the old cartoons have overtly racist and sexist characters and portrayals of non-whites and females. The cartoons glorify fighting, inflicting pain, making fun of people. They set a standard for what is "funny." The 1960s only served to reinforce those cultural norms. Suffice to say that by the time I started my first real job in 1982 at Temple University in Philadelphia, I had undergone both assimilation into white US culture and acculturation as I fully embraced my Mexican heritage and Latino culture.

As a young professional, I became quickly aware that I needed to recognize my biases in both my professional and personal lives. And if I wanted to be a better statistician, researcher, mentor, team member, or leader, I recognized I needed to undergo significant personal growth in areas related to JEDI. So much of my life has included self-reflection and attempts to overcome the biases so deeply instilled since childhood.

Over the years, I have made terrible gaffes and repeatedly demonstrated that my JEDI journey is long, hard, and sometimes painful, especially when being brave enough to admit my own shortcomings. As I have discussed in other columns, your personal and professional growth will be meaningful and rewarding if you can allow yourself to be vulnerable and admit to and face your own biases. And, yes, sometimes you find you took two steps forward and a step backward. But that is okay because it is all about striving to make progress.

The ASA's JEDI Outreach Group can help you in this personal journey. By working with others, you can make a difference in the ASA and its membership, and that can help you at your workplace and in the broader statistical community. Collectively and individually, JEDI members will be modeling behaviors that can create a more open and productive culture. By living our JEDI values, we can help others realize the benefit of a more equitable, just, diverse, and inclusive association and society. In a sense, it is an antidote to the biases that have built up over a lifetime. This can help improve our culture in the ASA and in society.

The JEDI group is a resource we can all embrace as part of our own JEDI journeys. Each of us is a "work in progress" with a different starting point. My starting point was a holey Davy Crockett T-shirt, and I think of that hole as my portal to personal JEDI improvement. Please join our trek. And by the way, what's your portal?

Robert L Santos

BARRY NUSSBAUM:
EPA 'Statistics Guy' and Persuasive Communicator

Kim Gilliam, ASA Marketing and Communications Coordinator

Barry Nussbaum grew up in Jamaica, New York—a neighborhood in the borough of Queens—and is a product of the city's public school system. He was motivated to pursue mathematics by a middle-school algebra class, even though he openly admits he was not one of his teacher's best students.

Nussbaum recalls having to pass a New York state Regents exam to pass the algebra class, and it was just around the corner. So, with his back against the wall and only a week to prepare, he began cramming and soon realized algebra wasn't so hard after all. Nussbaum found he liked it—a lot—and aced the all-important Regents exam. He had an aptitude for math and would pursue a mathematics degree in college.

For his undergraduate work, Nussbaum attended Rensselaer Polytechnic Institute in Troy, New York, before earning a master's and doctorate from The George Washington University, where he would eventually do some adjunct teaching of graduate statistics.

Nussbaum joined the United States Environmental Protection Agency (EPA) in the mid-70s and made his mark as the "statistics guy" who helped phase out leaded gasoline and phase in tighter car emission restrictions.

Part of the success behind these big wins for Nussbaum and the EPA was effective team communication. Nussbaum worked with policymakers, scientists, engineers, lawyers, and economists and quickly observed that to make an impact on policy and regulatory enforcement, succinct communication would be required to help these nonstatisticians understand the implications of his findings.

This interpersonal communications strategy became a foundation for his famous mantra, "It's not what we said; it's not what they heard; it's what they say they heard." The magic behind the mantra guides Nussbaum's approach to professional collaborations, presentations, podcasts, and one-on-one conversations. He is old school. When possible, he prefers face-to-face engagement rather than phone calls, texts, and emails.

In 2017, Nussbaum served as ASA president and placed communication and engagement among his top presidential initiatives. He launched what was dubbed the "Asian initiative" and sought to address the needs of Asian students and young professionals in the field and learn how differences in cultures and customs might be affecting their involvement in statistical societies. He established a task force to determine the specific needs of this segment of the membership and help overcome language and cultural barriers.

A Q&A with Barry Nussbaum

What was your experience like at the EPA as the "statistics guy"?

First, I'm not one of those "tree huggers." At the EPA, we understand and respect the importance of the environment and strive to be well balanced about it. Regarding my experience, it was quickly apparent that with a team comprised of engineers to economists and everything in between, I needed to learn their vocabulary. Likewise, they needed to understand the numbers and how to integrate these into their minds to develop policy and regulatory action.

Early on, my team went after truck and car pollution, and boy you better understand both the

data and the science around what's coming out of a tailpipe. My job was to translate for policymakers the correlation analysis between various ways of measuring vehicle emissions and the resultant air pollution—with its serious impact on public health.

Based on the data, our recommendations—among other things—was to develop sampling protocols to efficiently sample in-use vehicles and demand recalls for those exceeding standards. One of our other major projects was to demonstrate how phasing out leaded gasoline was a truly cost-effective method of curbing harmful lead emissions. And we were successful.

What was your interaction like with President Jimmy Carter during this time?

As one would expect, there was some pushback on the phasedown of leaded gasoline. On the heels of the gas crisis a few years earlier, when people were getting up at 3:00 a.m. to get in gas lines, the Commerce Department sought to increase the volume of gasoline by squeezing out as much from crude oil as possible. One way to do this is to allow slightly more lead into leaded gasoline. Demand was high. The policy question was, do you allow increases in the amount of elemental lead in leaded gasoline to benefit the nation's commercial interests, or do you stay the course and phase it out in favor of public health.

We got a call one morning. The EPA administrator needed a graphic showing the correlation analysis between the use of leaded gas in cars and its impact on public health. In particular, we'd been collecting data on blood lead levels in children. It is well known that lead ingestion or inhalation causes behavioral issues, low IQ, brain development problems, and more. Our data showed the blood lead levels going down as we began to phase out leaded gas. Interestingly, the numbers went up slightly in the summer because kids were outside playing ball in the street and were more exposed to the lead car exhaust, since lead is a heavy element.

The correlation between gasoline lead and blood lead was strong and convincing. It was a simple graphic on a piece of paper—nothing spiffy like you see today. Smudged, in fact, by the time it got to President Carter's desk. But the simple graphic was persuasive, and the decision ended up in our favor. For a statistician, having that kind of impact on policy is as good as it gets.

It just goes to show how important images and graphs can be in communicating your message—critical when you are trying to boil down complex information. They can see it and make sense of it. Amazing.

Describe your communication style.

Have you heard the strategy where you make believe you're writing to your grandmother and try to write it in a way she would understand? I don't particularly like that one. I have my own. I've given many talks over the years, and I look at the audience and make believe it's about 10 minutes before noon. And then I spot that guy already wiggling in his seat looking at his watch; he can't wait to get out to lunch. What are you going to say? How can you capture that guy's attention? I like the challenge of getting to that one person.

I was honored to be the dinner speaker at a Philadelphia Chapter meeting one year and a lady came up afterward and said, "You know, my husband is an officer in this chapter, and he drags me to this meeting every year. I've never understood any of the speakers until tonight. You really made it meaningful." That was very, very gratifying.

What do you think about social media and other communication platforms?

First, let me say I like podcasts. They are tremendous learning tools. I have a Twitter handle. I tweet from time to time but haven't been too active lately. I know people tweet their thoughts and issues and share information back and forth. My preferred mode of communication? I like walking around the office and actually talking to people, rather than calling or sending an email. You can see the reaction on their face, they nod their heads, and we have a real discussion. I see more and more of my employees send emails and text messages, and the return message might be an emoji or something. An emoji!! We're not even having a dialog here. It's a problem.

And with the pandemic, we were all on Zoom. I'd have 45 people in my gallery view and we looked like we were on Hollywood Squares. How do I know if the students are understanding my lecture on sampling theory? Turning off their camera, reading the paper, doing whatever. And I'm still talking away with no visible reaction. I'm a guy who gives lots of talks and really works an audience, so Zoom is a little hard on me.

I've had some colleagues who say, "Wow, Zoom is terrific. Instead of inviting a speaker and having to pay their expenses, they can present their seminar on Zoom." Some people find that very appealing. Me? I'll keep showing up to talk in person. ∎

EMMA BENN:

Professor, Mentor, Interpreter, and Advocate

Kim Gilliam, ASA Marketing and Communications Coordinator

Emma Benn experienced a joyful life change in 2020 when she and her wife, Nicole Dennis-Benn, welcomed two new additions to their family—baby boys they affectionately refer to as Peanut and Dumpling.

Becoming a new mother to babies they call the "most precious in the world" during the pandemic had its challenges, but these didn't slow Benn down. In addition to serving as an associate professor and the associate dean for faculty well-being and development at Icahn School of Medicine at Mount Sinai, she launched and was named founding director of the Center for Scientific Diversity (*https://labs.icahn.mssm.edu/bennlab*).

Benn created the center to increase the research success and ensure equitable advancement of underrepresented faculty investigators in academic medical centers across the country. The center is also committed to increasing the representation and retention of underrepresented students in the biomedical research workforce. The center is unique in that the staff there apply a rigorous, antiracist, research-driven approach to accomplish these goals. Benn got the green light in June 2020.

Hailing from the Main Line, a suburb of Philly, Benn attended Harriton High School, where she played sports and the violin in the orchestra. She excelled at science and math but fell in love with Spanish. Studying the language opened her to another culture, another world, and a way to communicate with other communities. Benn pursued a Spanish major at Swarthmore College and aspired to be an interpreter at the United Nations.

However, swayed by the limited summer job opportunities for someone majoring in Spanish, Benn set her sights on chemistry and landed an internship her senior year at Johnson & Johnson as a quality control chemist. That turned into her first job out of college. Today, with a doctorate in public health from Columbia University, she sometimes wonders what it would have been like to be an interpreter or if *she had continued down her path as a poet*. What many in the statistical community may not know is Benn is passionate about the "spoken arts."

Q&A with Emma Benn

What are the spoken arts?

When I was in college, my godbrother, Craig, used to take me to Philly to visit the art galleries, one of which—the October Gallery—was also a "spoken word" poetry spot. I thought it was pretty cool and began participating and competing in the spoken word scene. I loved it. It was a mechanism to communicate the things I loved, that made me angry—a platform to share thoughts and feelings.

When I went to New York for grad school, I competed at The Bowery, working problem sets offstage. I ultimately won a competition at Bar 13. It was nice to feel empowered through the spoken word in this way. My wife is a novelist and calls me a poet, although I knew poetry would be difficult for me to fully pursue. I am grateful to my godbrother for exposing me to the arts.

> "I'm learning to better communicate inclusivity in the classroom and doing everything I can to raise awareness that different voices, different people only make our field stronger.

Any regrets about not becoming an interpreter?

Maybe in some way, I *am* an interpreter. As a statistician, I'm constantly having to communicate things that my collaborators may not understand so they can make effective clinical decisions. And I'm always looking for the best way to teach the importance of communication to those I mentor. There are so many statisticians out there who are amazingly brilliant, but I feel strongly that collaborators want to work with statisticians who are brilliant communicators, as well.

What's your philosophy on mentoring?

Mentoring is so important. It's something we should all be doing, right? It's not easy. Sometimes I have folks who need help getting to the next step and, in my mind, I want to make it easier for them. How do I help navigate so they don't have to follow 20 different pathways to get to where they want to be? I also stress how communicating effectively plays into being confident about expressing their work.

I encourage them to observe how people explain themselves. I also recommend reading. How will you explain your thoughts after you've finished a scientific article? Don't just read for the science; consider how you would structure your arguments.

Honest communication between the mentor and mentee is key when discussing where they are doing great and where they need to work harder. But I also want my mentees to express to me how I am as a mentor and where I can improve. It makes me happy when they are comfortable talking to me. I am always willing to listen and to take critiques.

Dovetailing off mentorship, what are the goals of the Center for Scientific Diversity?

The center enhances the pipeline of underrepresented students into the biomedical research workforce. I have always been focused on biostatistics students and trying to diversify the field of biostatistics, but I wanted to have another platform where I work with a whole host of scholars dedicated to this effort. Students need to feel like they belong in this field, because there were times when I questioned whether I belonged. I want to help them bring everything they have to the table—their experiences, culture, identity—and to reinforce that they are needed, they are valued, and they will reach their goals if they put in the work.

Where do you see the statistics and data science community on diversity and inclusion, and how does communication play a role?

We've definitely made strides here. We've put interventions, best practices, and cultural changes in place, but we still have a lot of work to do. There are progressive thinkers in our field who I believe will help transform the field, but we need to make sure everyone with intersectional identities has a seat at the table.

It took me a while to own all my identities. Like, if I go into a space that is focused on inclusivity and increasing opportunities for racial/ethnic minorities in the field, is it okay for me to also own that I'm a lesbian and a woman? These are the things I think about. I'm learning to better communicate inclusivity in the classroom and doing everything I can to raise awareness that different voices, different people only make our field stronger.

What do you think of social media as a communications platform?

I use Twitter a lot. It's helped me to get connected and build a community in the statistics and data science fields. We can share ideas and that's a good thing, even when things are difficult like the back and forth on Twitter about renaming the COPSS award. There was a lot of exchange. Multiple sides trying to figure out how we effectively communicate our opinions to push for change. And that is a positive.

Final thoughts?

We need strong communicators, we need strong educators, and we need strong leaders. Many of the leaders who I admire most in our field have effectively established their own styles of communication that are so inherent to them, and they make me want to listen. ∎

'Sailing Your Own Path':

An Interview with JERI MULROW

Claire Bowen, Urban Institute

> **I never had a career goal in mind on where I wanted to be. I just wanted to do work that I found interesting, challenging, and rewarding.**

Jeri Mulrow was not afraid to take a chance or make a change in her life, as long as she followed interesting opportunities. She wanted to work on open-ended problems that had no obvious solutions. As the current vice president and director of statistics and evaluation science at Westat, this mentality has served her well. But how did she get there?

Her winding career path started after graduating with her master's in statistics at Colorado State University. She had an opportunity to work locally at the National Institute of Standards and Technology in Boulder, Colorado, through faculty connections. She reflected, "It was my first job and

[I] really enjoyed it. I thought, this is the best job ever!" She then joked, "It was my first job, and it was the best." Her enjoyment came from working on a lot of cool and interesting research projects that were a mix of theory and practical applications.

Soon after, she shifted her career into academia to solve her "two body problem," the problem of navigating dual careers for life partners. Her family moved to Illinois, and she taught as a lecturer at Southern Illinois University.

However, Mulrow quickly discovered teaching "wasn't [her] cup of tea" and sought a new position as a mathematical statistician at the Internal Revenue Service Statistics of Income (SOI) Division in Washington, DC. For eight years, she tackled several challenging and interesting problems at SOI before returning to Illinois as a statistician for NORC at the University of Chicago and then going back to DC as a senior manager at Ernst & Young.

Still following her passion for interesting challenges, Mulrow returned to work for the federal government, moving to the National Science Foundation National Center for Science and Engineering Statistics (NCSES). She found NCSES provided ample opportunities to explore and tackle open-ended problems, which led her to heading up the center as deputy director.

After serving at NCSES for 15 years, Mulrow wanted a change of pace and became the principal deputy director of the Bureau of Justice Statistics. She remained there for three years before leaving government and taking her current position at Westat.

Mulrow and her sister, Cathy Grace, in front of the National Museum of China just outside the Forbidden City

Throughout our conversation, Mulrow noted supervisors who shared a similar vision for wanting to "change things up" and were advocates for her career.

She described both Fritz Scheuren at SOI and Lynda Carlson at NSF as forward-thinking individuals who were open to change. Mulrow also had candid conversations with them about what she did or did not like, so they could easily advocate for her career. For instance, she wanted to participate in a month-long government leadership training program that would not have been possible without Carlson's support.

Mulrow remarked that finding people who can advocate, mentor, or champion another person's career is a mix of luck and hard work. In other words, she sought and developed relationships to increase the chances that someone would recognize her hard work.

Jeri found statistics to be a great foundation for her career and the federal statistics system to be a supportive environment for women, especially within leadership positions.

> " Being a part of the ASA has helped me a lot, both directly and indirectly, by getting to know so many people and building many relationships.

As she pursued her graduate degree, she witnessed women in statistics already blazing the path for the next generation:

- **Barbara Bryant**—US Census Bureau director during the 1990 Census

- **Barbara A. Bailar** —1987 president of the ASA and US Census Bureau associate director for statistical standards and methodology

- **Cynthia Clark**—1989 president for the Caucus for Women in Statistics, administrator for the National Agricultural Statistics Service, and director of the Council of Professional Associations on Federal Statistics

- **Katherine Wallman**—Chief statistician of the United States from 1992–2017

From Mulrow's perspective, these women and others in lead statistical roles helped remove some (but not all) of the stereotypical challenges women often face in STEM.

When first getting involved in the ASA, Mulrow participated in the Colorado-Wyoming ASA Chapter's annual student presentation event. Since then, she has continued to engage in ASA activities through the Washington Statistical Society, committees, and sections.

"Being a part of the ASA has helped me a lot, both directly and indirectly, by getting to know so many people and building many relationships."

When asked about overcoming personal and professional challenges, Mulrow said, "I always think of the sailing analogy. We rarely go from point A to point B in a straight line. Sometimes the wind is blowing in the opposite direction you want to go, but you still have to try to figure out how to move ahead and use the sails. You might head out one way before you flip your sails to change the direction to try and get back on course. This tactic is often not efficient and can be very frustrating, but I tell myself that maybe I will learn something along the way, or maybe I'll come up with something more creative than I thought. We have to keep looking forward, learning along the way, and correcting the course with our sails, or we will instead hit a wall and go nowhere." ∎

State of the Education Data Infrastructure:

What three experts have to say about the National Center for Education Statistics

Steve Pierson, ASA Director of Science Policy

For the state of the data infrastructure series, the ASA Count on Stats team spoke with three experts on the National Center for Education Statistics (NCES): James L. Woodworth concluded his three years as NCES commissioner in June 2021; Jack Buckley was commissioner from 2011 to 2013.; and Felice J. Levine is executive director of the American Educational Research Association and chair of the board for the Council of Professional Associations on Federal Statistics (COPAFS).

NCES, which is in the Department of Education's (ED) Institute of Education Sciences (IES), provides objective, reliable, and trustworthy statistics about the condition of education through administrative data collections, statistical surveys, longitudinal studies, and assessments. Founded in 1867, NCES is the second-oldest and third-largest in budget among the Office of Management and Budget's 13 principal federal statistical agencies. NCES's combined statistics and assessment budget lines account for about $260 million annually.

Contracting, staffing, budget, stature, and autonomy figure prominently in this exchange. For background, NCES has a budget-to-staff ratio of approximately $2.75 million per full-time employee—more than seven times the median ratio for the 13 principal federal statistical agencies—according to ASA-compiled data for the 13 federal statistical agencies (see Figure 1 and *https://bit.ly/3ireWqH*). This large ratio is explained by NCES's heavy reliance on contractors, which Woodworth reported at a June COPAFS meeting as 875 full-time equivalents (FTE) to 95 NCES FTE employees (see Figure 2). The 9:1 contractor to employee ratio does not include the additional field staff needed for a big collection year like the upcoming 2021–2022 school year.

For contrast, the Energy Information Administration, which has an annual budget of $126 million (for FY21) reported at the same COPAFS meeting 359 employees and 300 contractors.

NCES has also lost 8.6 percent in purchasing power since FY09, though that amount has been reduced in recent years, as seen in Figure 3 (top panel). (See also *https://bit.ly/2VyD3dU*.) Much of the recent gains have been to NCES assessment work, which was funded this fiscal year at $165 million. The NCES statistics have been more
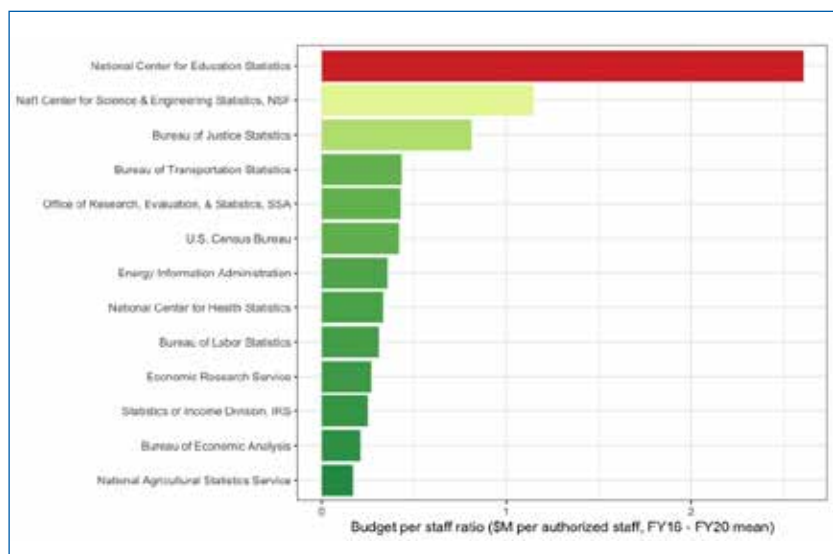

Figure 1: The budget to staff ratio for the 13 principal federal statistical agencies
Graphic by Jonathan Auerbach and Jordan Bryan

875
FTE contractors
(each person = 50)

95
employees

Figure 2: A schematic emphasizing NCES's heavy reliance on contractors due to department-imposed staffing contractors

NCES Statistics and Assessment Funding

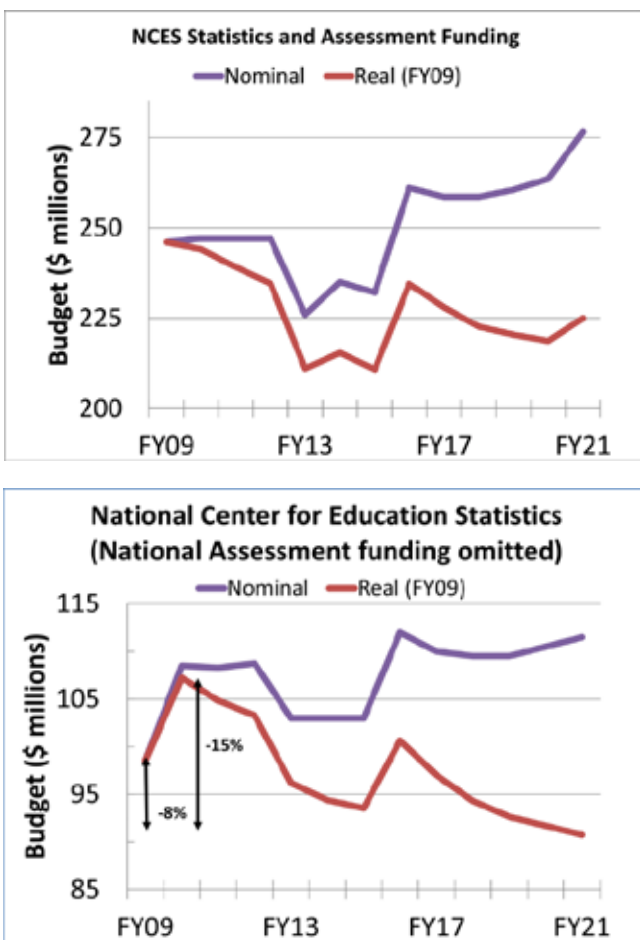**National Center for Education Statistics (National Assessment funding omitted)**

Figure 3: The total NCES budget (top) and statistics component (bottom) for FY09–FY21 in nominal and inflation-adjusted dollars

stagnant, losing 15 percent in purchasing power since FY10, as shown in the bottom panel of Figure 3.

NCES has also lost autonomy and stature over the past two decades, undermining its ability to produce objective education statistics. NCES was moved under the newly created IES in 2002; its advisory panel was disbanded; and part of its budget, hiring, and contracting control was transferred to the IES director. A few years later, NCES's authority to promise data confidentiality was weakened by the Patriot Act. In 2012, Congress removed the requirement of Senate confirmation of the commissioner, and there have since been several proposals to remove presidential appointment of the NCES commissioner. Finally, IES's work to build its profile comes with diminishment of NCES's profile. Figure 4 illustrates the NCES diminution.

The bottom line is that, despite the establishment of ED in 1867 "for the purpose of collecting such statistics and facts as shall show the condition and progress of education," NCES in the 21st century has a relatively small profile within ED—some would also argue it is declining—and is hamstrung

by overly burdensome bureaucratic constraints around hiring and contracting, declining purchasing power, and access to individual-level records. It nevertheless remains a vibrant agency staffed by employees who produce high-quality statistics and assessment and make important contributions to the broader federal statistical community.

STEVE PIERSON: As the second-oldest statistical agency in the United States, NCES has a rich history of informing the decisions of students, families, and school districts. What are some of the agency's most important contributions in recent years?

JAMES L. WOODWORTH: One of the most important things NCES does is help us understand the condition of education in the United States. Because education is a state's right, rather than a federal activity, it can be difficult to make comparisons between states if you don't have an agency collecting the data in a systematic way across the country. NCES plays a role that is unique among the federal agencies in that it works heavily with states to help them come up with common reporting measurements they do voluntarily.

FELICE J. LEVINE: When the federal government defined the role of NCES more than 150 years ago, it determined that understanding education in the US was essential to helping the states move forward. While NCES's role has transformed over time, this function has remained enduring and essential. When you think about the leadership role of NCES, for example, with the development of the statewide longitudinal data systems—the SLDS—you can see very palpably how the agency catalyzed building quality administrative data systems with records and administrative data that otherwise could have sat in drawers or the electronic equivalent. We now have state longitudinal systems that can be meaningfully used by school districts and state education agencies, as well as by policy analysts, researchers, and other data users.

Let me also respond to Steve's comment in our preliminary discussions that NCES products do not move the economic markets. I disagree. It does move markets over the long term. From early childhood and workforce data to the international assessments of adult competencies, NCES data are instrumental to understanding consequences of education on US health and our labor force. NCES has provided the backbone of so much of what we know in these areas.

JACK BUCKLEY: Where NCES is fascinating and unique compared to other statistical agencies is the assessment role. Even when you look at those that partially overlap with respect to adult education in
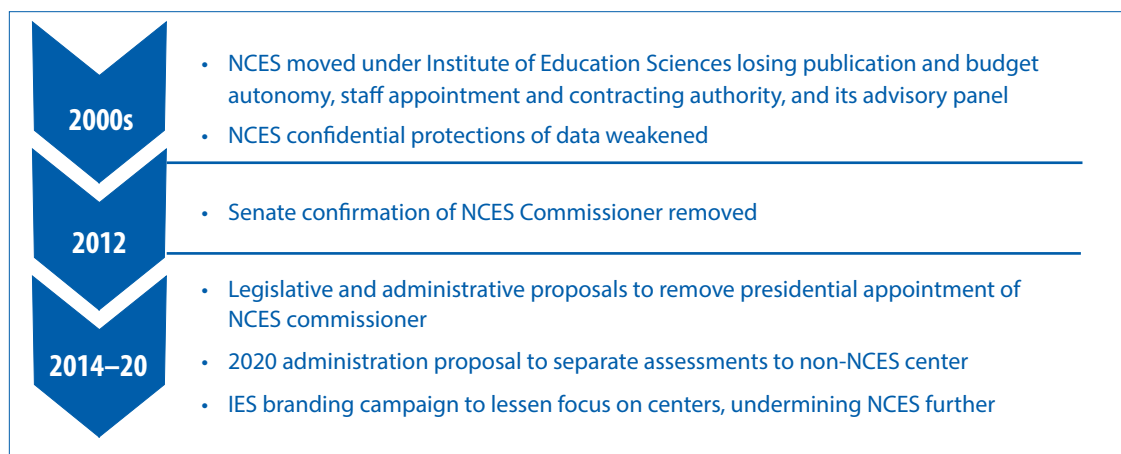
Figure 4: Schematic illustration of reductions to NCES autonomy and stature since 2001 (Elchert/Pierson, *https://bit.ly/3mbQQCn*)

the sciences, like NCSES, or with respect to the workforce, such as the Bureau of Labor Statistics, NCES is the only statistical agency in the United States that assesses cognitive skills of individuals at all levels, including adult learners. That role takes a lot of specialized scientific knowledge, working with a whole different suite of tools and constraints, and it's very difficult to do well.

STEVE PIERSON: What are some of the most widely used or watched products from NCES?

JAMES L. WOODWORTH: NCES provides really unique products that are critical for understanding not only the education system, but the world as a whole. A good education system in our country directly relates to having a strong economy. These products can only be provided by having a centralized organization that is able to bring information in and put it out in a way that people can use. It makes the work NCES does collecting this data and the unified, unbiased, and politically neutral manner so critical and so important.

FELICE J. LEVINE: The longitudinal surveys that embrace all levels of education were well ahead of their time and remain invaluable for understanding educational experiences and outcomes, including long-term consequences. For example, ECLS, the Early Childhood Longitudinal Study, is more than 20 years old and has been invaluable to improving education and understanding how family, community, and individual factors connect to education and educational outcomes. The longitudinal surveys have helped with understanding educational impacts not just in the short-term, but with a longer lens on workforce and health consequences.

JAMES L. WOODWORTH: Let's also not forget the post-secondary world, where you have the Integrated Postsecondary Education Data System (IPEDS), an incredibly useful product that brings in information from all over the country in a way that's comparable. The College Scorecard is also a very useful tool for families, especially those who have less knowledge about the post-secondary experience, such as first-generation college students like me.

STEVE PIERSON: How does NCES continue to play a role in policy and decision-making, not only through pandemic recovery, but in the next five to 10 years?

JAMES L. WOODWORTH: NCES has to become more nimble. It needs to balance accuracy with timeliness. We made significant progress on this during my time as commissioner, but there is more work to be done to be able to respond to things that happen in real life like COVID-19 or the next crisis that hits. Decision-makers need to be able to quickly access information about the schools and about the impact. It's not enough to collect the data rapidly. You can't spend a year processing it. You need to turn it around fast. When the pandemic hit, because of bureaucratic hurdles, it became clear to us that it would be a year before we could provide new products, and the nation at that point didn't think the pandemic would last that long. Thankfully, Congress has helped us in the meantime to provide funding and two FTEs for the School Pulse Survey to be in the field this fall. It will collect data monthly and provide very quick turnaround.

JACK BUCKLEY: I agree. The Newtown, Connecticut, school shooting happened while I was commissioner. I was the only person left in the office and we got a call from the White House saying we needed to

James L. Woodworth concluded his three years as NCES commissioner in June 2021.

Jack Buckley was NCES deputy commissioner from 2006–2008 and commissioner from 2011–2013.

Felice J. Levine is executive director of the American Educational Research Association and chair of the board for the Council of Professional Associations on Federal Statistics.

know right then the percentage of schools that had armed guards. I had to unlock the data cabinet and run the analysis myself. In this case, we were fortunate that we had a relevant data collection on school safety, even if we hadn't reported this particular statistic previously. It's a bigger problem, of course, if you don't have the data already. Many years ago, NCES put in place a fast-response survey system, and the agency has since made some progress in that area. Nonetheless, we need to figure out how to remove some of the bureaucratic barriers and increase the capacity of the agency to be more agile and produce more timely and relevant statistics. We need to continue to build the sort of "muscle memory" that makes NCES more responsive.

FELICE J. LEVINE: There are many users who wish data were accessible faster and sooner. But in my own experience with the suite of federal statistical agencies, NCES has led over decades in access to public use files and procedures for allowing data users access to restricted data sets, with high levels of data protection and security. NCES also continues to be forward looking in offering public use dashboards, downloadable files, and other tools. Could they be more "muscle" ready as Jack notes? For sure, but I think the ambition for rapid, independent reporting is there.

JAMES L. WOODWORTH: Incorporation of response process data in NAEP also has enormous potential for assessment. Thanks to technology, we can record information such as time to respond to a question and whether a response is changed, which will give us insights into how students think. NCES is bringing in different forms of expertise to understand student decision processes.

STEVE PIERSON: What are some of those bureaucratic barriers?

JAMES L. WOODWORTH: One of the core problems is that NCES has to contract out so much work because the staffing is tiny. That creates a lot of problems. It means you don't have the ability to innovate and experiment with new things. You have to run the old systems while you're developing the new systems, so you can compare to make sure they're compatible. If you don't have any slack and you don't have any staff overhead time that you could apply to innovations, then you don't get innovations. In addition, NCES doesn't even have an IT person. One consequence is the agency doesn't hold the data on its own systems anymore, because they don't have the capacity to manage a highly sensitive system.

That's where NCES is right now; there's just not enough overhead. NCES's staff is phenomenal.

Their work ethic is amazing. What NCES is able to accomplish with wrangling all these contracts and work, while still managing to move forward and push the boundaries on some topics, is because of the fantastic staff. That is key. NCES really does have an excellent staff; it's small but great.

FELICE J. LEVINE: The innovation and good work NCES has accomplished comes with tremendous casualties and losses along the way. There are not enough resources. We've mentioned the heavy reliance on contracts, the low staff size, the absence of sufficient funds for vital data collection or reinvention of data collection, including the National Survey of Postsecondary Faculty that was put on a back burner. The information we had on community college faculty, four-year institutions, and those without doctorates in other environments are lost assets. We know today how much we need that information as we rethink what higher education and technical training should look like.

JACK BUCKLEY: There is room for reinvention and some bureaucratic streamlining to reduce the many, many months of the lead time it takes to make a change in an NCES collection. And that's not driven by the fact that the agency doesn't have enough staff. It's driven by the fact that one needs to follow a very precise set of instructions in order to make even a small change to a survey instrument. I think this is very important sometimes for quality, but in other cases, it negatively affects the agency's ability to be flexible. When I was there, we tried and failed to get more autonomy in contracting, even if it meant having contracting authority delegated to IES. Having contract officers at the IES or NCES level would have improved that bottleneck, which I can imagine has only gotten worse as the rest of the Department of Education has shrunk.

JAMES L. WOODWORTH: What Jack mentions is indeed an additional layer of burden to the heavy reliance on contractors. The bureaucratic challenges within the department of having the contract approved is a big bottleneck. I do want to credit that OMB's work for approving NCES work through the Paperwork Reduction Act (PRA) is remarkably efficient and smooth, owing in part to the quality of NCES PRA packages. The bureaucratic challenges within the department are much more a cause of delay.

STEVE PIERSON: Is there one thing you think would be a game changer for NCES?

JAMES L. WOODWORTH: The big game changer for NCES would be the passage of the College

Transparency Act and allowing NCES to collect more individual record–level data, which NCES is prohibited by Congress from collecting. And that makes it really hard to do analysis, especially post-hoc analysis, and verification of the data. It's also more challenging for the institutions that have to report more fields of data. Even members of Congress are sometimes disappointed, asking why NCES can't release data in the way the Census Bureau does. It would be very helpful if NCES had a little more ability to collect individual record data, even the de-identified individual record data would be more useful than how we collect the data now.

FELICE J. LEVINE: I agree. Passage of the College Transparency Act would be a real plus. In addition, I think a game-changer would be some innovative thinking about how we deal with low response rates and serious consideration of the very real trade-offs between administrative data and primary data collection. Where NCES has led and can further lead is to work through the complexities of data linkage, so we also don't collect data that can be ascertained elsewhere. Such advances would make a difference in moving forward; reducing response burden; and getting the quality information school leaders and teachers, faculty at all levels, school districts, and the higher education and research communities need.

JACK BUCKLEY: I agree that it would be untying the agency's hands from behind its back with respect to unit record data collection at the population level for all students. One of the great privileges of being commissioner was representing the United States in international settings around education data. There was never a time I mentioned to ministers in similar roles from other nations that the United States did not have a population register of its students and couldn't track them through their educational experiences that their jaws wouldn't fall open. Meanwhile, our high technology company sector is tracking their citizens through their entire lifetime experiences.

STEVE PIERSON: Please speak to the downward layering, the loss of presidential confirmation, and any other autonomy stature issues going on.

FELICE J. LEVINE: The role of the NCES commissioner to advise the secretary of education and IES itself on the evidence base of policies or research program priorities gets lost with, as Bob Groves put it more broadly, the downward layering of federal statistical agencies.

The pathway of the commissioner reporting independently to the leadership in the department has been lost and eroded over time. That is an unintended loss, in particular with the passage of the Presidential Appointment Efficiency and Streamlining Act of 2011. It was not targeted at NCES; it justifiably removed Senate confirmation for hundreds of positions but NCES was collateral damage. Hard to believe it has been 10 years; we hope to hold on at least to presidential appointment in any IES reauthorization.

JACK BUCKLEY: I agree that it was unfortunate. If I had to choose one thing, however, contracting autonomy would be more important to me than Senate confirmation. That doesn't mean I don't agree, but I think on the scale of challenges, it's minor relative to staffing and contracting red tape.

JAMES L. WOODWORTH: I do also feel that the loss of Senate confirmation did result in a loss of stature for the position. Anyone who has ever dealt with the government understands that's pretty critical. The level of importance of your position carries a lot of weight, especially when you have a new person coming in or an administration changes. There were times when I had to say no. I did not always agree with the politicals and what they wanted to do. The fact that I could say no with confidence was important. I'm shocked that I actually made it through the duration of my term, and I think a lot of that was due to the fact that it's pretty hard to fire the commissioner.

It's also really important that you have an independent statistical system. The fact is, in American democracy, we change parties and leadership and both the executive branch and the legislative branch so regularly. You need people who are collecting the data, collecting in a consistent manner, and not shifting the focus to suit the needs, both in a positive and a negative way for the sitting administration or the sitting Congress. It is important that you protect the role of the statistical agencies, and one way you do that is by keeping the head of the agency in a position that has seniority attached to it. Being a presidential appointee definitely adds to that. Every layer of bureaucracy above a federal statistical system is another layer of bureaucracy that thinks they have a legal right to interfere with the operations of that statistical system. Unfortunately, they do exercise that perceived right when I think the law is clear they are wrong. ■

NAVIGATING
Tough Conversations *in* Statistical Collaboration

Uncomfortable conversations are inevitable in many research and professional relationships, including statistical collaborations. Topics can vary widely due to the different backgrounds and expectations of researchers. Common discussions include those about coauthorship, the role of the statistician, and even technical concepts. Reasons for discomfort can include misaligned expectations, the tone of either participant in the conversation, and particular topics or words (e.g., bias) that might escalate the conversation from congenial to difficult.

Although it feels difficult, it is important to navigate our way through uncomfortable conversations with the goal of ending in mutual understanding and a clear path forward. In *The Champion Forum* podcast, Jeff Hancher argues that avoiding difficult conversations is a disservice to everyone and gives the following five reasons we should have them:

To build mutual trust – As collaborative statisticians, we build trust and respect by being honest with our collaborators, even around difficult topics.

To communicate value – We show collaborators we value them enough to have tough conversations.

To clarify the future – Without having a conversation, each party is left to their own interpretation and conclusions, which can be misunderstood and result in misaligned expectations.

To increase self-awareness – It is important to come to an understanding of where their (or our) understanding may be falling short.

To stretch our leadership – With each difficult conversation we have, our ability to have productive conversations improves and the range of topics we are confident in tackling expands.

We have found tough conversations are easier if we are prepared for them. When preparing for a conversation we expect to become uncomfortable, we strive to consider both our own point of view and the point of view of our colleague(s). We try to identify goals of the conversation beforehand, including our expectations for actions during and after the meeting. We might consider the mode of our conversation, as well.

Authors

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Scientific collaborators may initially communicate as if a statistician is a technician, using phrases such as "I just need you to run the statistics" or "I just need you to calculate a sample size." In this video (*https://bit.ly/3rYl4bz*), a researcher makes such a statement and the statistician responds. The scenario encourages discussion about next steps and how the conversation could have been handled differently, while also providing an opportunity to discuss the importance of asking specific questions about study design.

For example, email communication is sometimes necessary, but tone can be easily misinterpreted. To prepare, we might compose email drafts and let them mature for a few days before sending or have a neutral third party read the draft email, while respecting privacy. For in-person conversations, we suggest drafting talking points for particular topics ahead of the meeting. We also try to anticipate potential detours and roadblocks that may arise and plan paths around them.

Finding common ground is difficult, and success is far more likely if potential conflicts are approached from a calm, understanding, and patient mindset. While it may seem cliché, we have found using "I" statements to be more helpful than using "you" statements (e.g., "I feel the data could be organized better." vs. "The way you have organized the data could be improved.").

Regardless of the conversation modality, being willing to slow down and gather our thoughts allows for a more meaningful response. Slowing down deserves particular emphasis here, as most of us are working in fast-paced, extremely busy environments. It's important to

realize our collaborator in the conversation is likely under similar stress and might not come into the conversation from a calm space. This recognition provides an opportunity for empathy, which can lead the conversation in a productive direction.

Being a good listener and having a positive demeanor can improve the likelihood of positive outcomes in uncomfortable conversations. Being an active, empathetic listener while understanding nonverbal cues and emoting friendliness and confidence can help move a conversation forward. On the other hand, being judgmental, using unwarranted technical language, and not paying close attention to reactions—both verbal and nonverbal—can reduce the chances of a conversation going well.

We can also play to our strengths and use helpful resources when preparing for and navigating tough conversations. For example, we may ask a colleague for advice or solicit suggestions (if appropriate) from an online forum like the ASA Section on Statistical Consulting community (*https://community.amstat.org/cnsl/home*). We may advocate for having the meeting in-person instead of over the phone to facilitate clear communication or organize our ideas and goals ahead of the conversation.

We mentioned the importance of preparing for uncomfortable meetings, but the preparation itself can be challenging. It can be difficult to predict how conversations will go, especially for those with little practical experience. Facilitating effective and active training for early-career collaborators, such

as graduate students, is essential. In our own work, we have developed resources to engage students in potential discussions with rich enough context to provide them a chance to reflect and think through the communication of others, as well as their own, in a safe environment.

In our series of educational videos on statistical collaboration (*https://bit.ly/3rYI4bz*), we provide rich, realistic scenarios to engage students in exploring and reflecting on strategies to navigate tough conversations. Video topic three, for example—*turning down requests for new work from a current collaborator*—highlights challenges a collaborating statistician may face when being asked for additional work, as well as strategies for handling the request.

In the video, the statistician is prepared for the conversation and has strategies in place to enforce their boundaries. First, the statistician gathers information from the client about the scope of work and desired timeline. After the statistician explains they are at capacity for the next couple of months, the client offers the statistician additional financial support and coauthorship, both of which can be hard to turn down. The statistician thanks the client for the offer, but makes it clear their answer is still no. The statistician then offers to connect the client with another consultant or revisit the request in the future. The client graciously acquiesces as the conversation ends.

Many collaborative statisticians are helpful by nature and saying "no" can be challenging. However, having a strategy for turning down new requests is a way to say "yes" to maintaining high-quality work and good work-life balance. The statistician's goal for the meeting was to refuse future work with their collaborator, and they were successful.

On the other hand, in video topic 10—*pseudoreplication and refusal to use a statistician's advice*—both the statistician and collaborator express different needs or expectations from the collaboration. As statisticians watching the scenario, we may initially only be sympathetic to the statistician whose advice is ignored, but the client is also in a difficult situation. Because the statistician explained their reasoning in a kind way, there is still potential for the collaborator to ask for advice and run a different analysis in the future when the collaborator no longer has to worry about their adviser's unhappiness.

It is important to recognize a bad interaction with a statistician can have a lasting impact on a researcher's willingness to seek statistical advice or collaboration. We should strive to provide positive experiences for collaborators that will encourage them to continue to work with statisticians.

As video 10 illustrates, even with the best intentions and preparation, conversations occasionally escalate into discomfort. Some strategies for de-escalating intense discussions include the following:

- Check your own assumptions or stories about why the other person is reacting the way they are

- Consider taking a break

- Remain calm and professional without scolding or shaming the other person

- Stop talking and start listening—really listening, without preparing—while the other person is talking

As Motomi Mori and Rongwei Fu state in their chapter—Competencies Needed for Statistics Leadership from an International Perspective—in *Leadership and Women in Statistics,* "Uncomfortable and difficult situations are frequently only the result of misperception. You can make an effort to view them differently." It can be hard to confront conflict but communicating expectations and desires from both parties is important to having a productive and pleasant collaborative relationship. ■

What's Our Point? Flipping the Paradigm for Communication in Statistics and Data Science
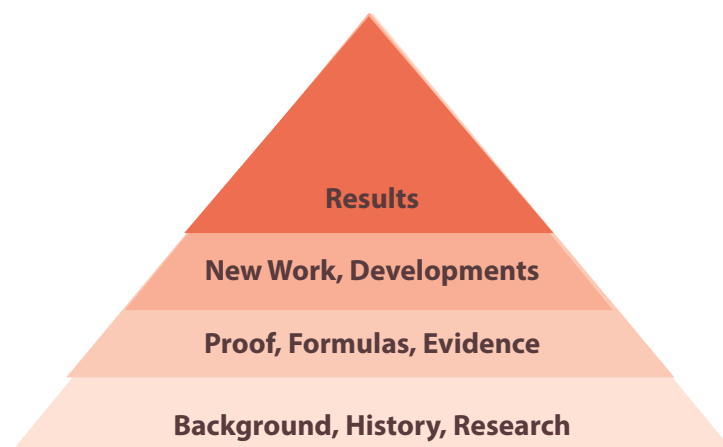
What if we have been going about communicating the message and importance of our statistics and data science work *upside down?* How we talk to each other is different than how others receive and understand information, including decision-makers, policy advisers, industry leaders, the media, and the public. And yet these are often those whom we are trying to reach to engage, inform, or educate. In a global, interconnected world, science communication and shared understanding become even more essential while battling the constant pull of everyone's time and attention. How we communicate to engage others and get our point across is crucial to our roles as data scientists.

Kathryn Sullivan—former NASA astronaut, former chief scientist at NOAA, and president and CEO of the COSI Science Center—recently spoke about the discipline of communication and framing conversation, deeming it "*the new social technology*" and "*the most important human technology*." As data scientists, we must think beyond communicating with our scientific colleagues to effectively communicating with leaders and decision-makers, as well as the media and public. Making your point in these settings often does not fit the traditional communication paradigm found in academic research talks. Perhaps we, as statisticians and data scientists, should aim to reframe our conversations and shift that paradigm.

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Traditional Paradigm

Traditional Paradigm
- Results
- New Work, Developments
- Proof, Formulas, Evidence
- Background, History, Research

Let's take a look at how we may flip the traditional paradigm for engaging in impactful and effective communication within our discipline and across scientific boundaries.

Traditional Paradigm

I was excited to be working on one of my office's high-profile projects during my first year in government, after having transitioned from academic research. Collaborative statistical work with scientific and expert colleagues resulted in a journal paper. The paper explained a clear need for the work, gave an overview of previous methods and cleanly described new methods, and offered compelling results with descriptive graphics. It was the perfect package for communicating the message and importance of the topic—all nicely laid out in a reasonably concise 14 pages.

My boss walked into my office and said, "Give me one bullet point on this." (What?!?!) I was a bit stunned; how could anyone possibly explain any scientific research or statistical analysis in one bullet point?

This experience was eye-opening. I, like many of us, was "raised" to read, write, and digest statistics journal articles and scientific papers under what I will call a "traditional paradigm." In this paradigm, statisticians and scientists are often trained to present and communicate their work from the bottom up. We lay out background and previous research to set the groundwork, describe or reference theorems and formulas to offer proof, show the need for the next-step and/or novel new method, and then explain the latest work/technique/breakthrough, often including a timely application (which may have been the original driver).

Flip the Paradigm

Background, History, Research

Proof, Formulas, Evidence

New Work, Developments

Results

Decision

There is absolutely a need for highly technical presentations, discussions, and journal articles that focus on detailed statistical methodologies. Much attention is already placed on this more traditional aspect of technical discussions and communication; it is arguably the default in conferences and colloquiums, as well as most collegiate courses. However, this traditional paradigm may miss the mark for different audiences. What is the goal for leaders and decision-makers? What is of interest to the media and the public? As data scientists engaging with these audiences, what is our point?

Flipping the Paradigm

Government, academia, industry—these are different settings with varying goals and distinct considerations. Leaders may be looking to fund a new feature or product, implement or change public policy, or explore new technological innovations. The aim for conversations with the media and public may be to inform or encourage action. Across these settings, the common theme is to make a decision and spur an action. So how do we engineer effective communication for these aims?

As we walk into the room, we should lead with our point—what delivers our message and engages the audience. We should flip the paradigm with a point-first pyramid framework for presenting results and decision factors. Open with the main message, the exciting conclusion, the research findings, the decision recommendation.

Time Magazine reports you have 7–20 seconds to engage your audience. The *Forbes* article, "How to Pitch Anything in 15 Seconds," describes the importance of a simple and straightforward message. In his book

Language Intelligence: Lessons on Persuasion from Jesus, Shakespeare, Lincoln, and Lady Gaga, Joseph Romm speaks to the importance of having a simple repeatable "hook." These all point to the importance of grabbing and engaging an audience's attention. This fits into a model I aim to employ: ERI (Engage, Relate, Involve). We are not necessarily aiming to fully explain complex scientific findings in a soundbite; we are aiming to *engage* the audience, *relate* the concept to them, and *involve* them in the discussion and solution. If more information or technical details are wanted/needed, they are available—in your full presentation, your report, the published paper.

The need to lead with your point goes hand-in-hand with an additional key consideration: time. There is a reason they are called briefings. You may have one minute or one bullet point to get your message across—maybe less.

Last year, I was giving a briefing on a major project at my organization's national information technology meetings. The previous session ran long and walking (virtually) into the session, I was told to keep it to 30
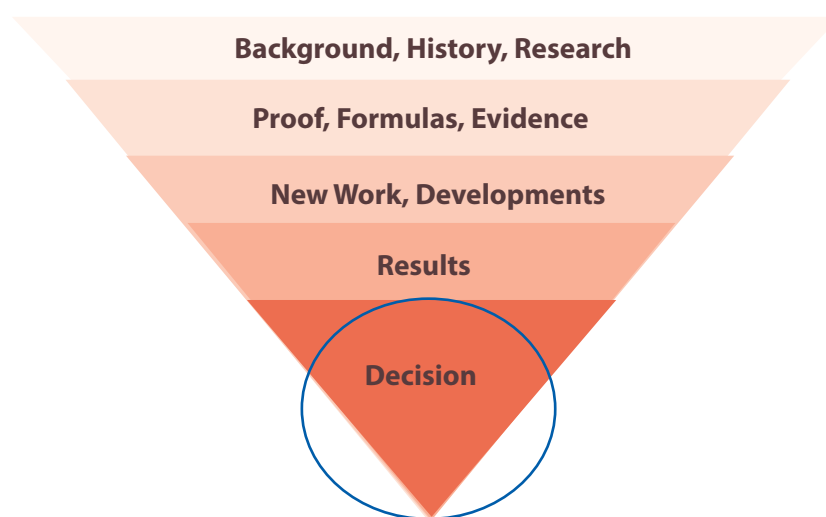
Scientific Language versus Nonscientific Understanding

Just as important as our communication structure are the words we use. Effective communication of statistical concepts and results has become even more crucial in the age of big data / more data / better data / bad data. How do we talk to nonscientific people about statistical science in a way that can be understood and generate interest, discussion, and engagement? Being able to express the importance of our work in a way that resonates with others is critical.

seconds. On the fly, I needed to condense the briefing into just my point.

Think of a colloquial elevator speech, a common technique for networking and "impressing the boss" in a short impromptu elevator ride. What excites you? What should excite them? Follow-ups may come in that instance, time permitting, or at a later point.

How We Communicate Among Ourselves

Flipping the paradigm can also serve our own needs in the data

Communicating Across Generations

We are living in a new age of communication. Formal letter writing has been replaced with emailing and instant message dings have become our background noise. Telephones travel with us everywhere but are often used for everything but calling someone. Facebook (Wait, now everyone is using Instagram?!). Snapchat (It's gone?!). Twitter (You get 140 characters. No, wait! 280?) And how does one TikTok?

It can be hard to keep up, but it is essential to recognize there is a spectrum of communication platforms that have varied purposes and users.

Communication across generational styles can affect personal interactions and decision-making processes. How professionals in different roles and stages of their careers ingest, process, and distil information can be quite varied.

In *Sticking Points: How to Get 4 Generations Working Together in the 12 Places They Come Apart,* Haydn Shaw dives into each generation's social factors and world events that affected their formation as individuals and a generation. These factors affect how, when, and why different generations communicate differently.

These considerations can be especially important as we "brief up the chain" in the management pyramid. (An informal instant message is likely not the best way to relay our cutting-edge analysis results needed for the important funding decision.) Those in more established roles looking to increase their scientific collaboration with young professionals could also take note. (The freshly graduated new hire with their attention seemingly buried in their device may be checking the latest project update, not ignoring the weekly status meeting.)

As data scientists, it is critical for us to learn how to leverage expertise across generations. As communicators, it is important to understand not only where our boss or employee is coming from but also how to design our own communication style to effectively reach across generations.

science community. A statistics graduate student at a recent conference lamented they felt most presenters were giving the audience their appendix—formulas, theory, and past methods. It can be hard to follow along the entirety of complex technical details to arrive at an understanding of what is meant to be the exciting conclusion. I have often felt the same way. I remember how overwhelmed I felt at my first JSM (and since) and how I struggled through many a colloquium in graduate school and beyond. The traditional paradigm may not be the best avenue for engaging an audience that is new to the topic.

The idea of flipping the paradigm has started to spread in the scientific community, as well. Think about the last poster session you went to. What is the goal of a poster / poster session? Is it to learn everything about every project? Absorb someone's life's work in three minutes?

JSM 2019 had almost 900 posters—an amazing amount of information! How can we effectively and efficiently use these sessions to communicate relevant information to our current and potential colleagues?

Not only is a poster based on the traditional paradigm not designed to bring new statisticians or scientists to the conversation and research area, but it is also not likely to engage relative outsiders who may benefit from the knowledge and methodology. (I personally can't absorb disparate sets of formulas, theorems, proofs across dozens of posters.)

A piece on NPR's All Things Considered, "To Save the Science Poster, Researchers Want to Kill It and Start Over," introduces Mike Morrison, a doctoral student at Michigan State University who created a viral video in which he proposes a new poster design. According to NPR, "It looks clean, almost empty. The main research finding is written right in the middle, in plain language and big letters. There's a code underneath you can scan with a cellphone to get a link to the details of the study." It's the 7–20-second soundbite on a poster!

This is not to encourage us to only use 7–20 seconds to relay our scientific work; it is to implement the engagement stage of the ERI model to generate audience interest, possibly leading to involvement via a further conversation or future collaboration.

What's My Point?

The very nature of statistics as a scientific discipline requires good communication skills for effective collaboration and relaying of results. There are important non-technical aspects to communicating across a larger audience and into the public domain.

Progressing through my career, the most useful skill I have developed has been the art of technical statistics communication with nonstatisticians. Solid and effective communication skills are essential to relaying information to nonscientific decision-makers and the public. We need to reframe the conversation and flip the paradigm to best communicate our point. ■

Star Statisticians Offer
Career Advancement Advice

Claire Bowen, Lead Data Scientist, Privacy and Data Security, Urban Institute

"Be a good citizen," Bo Li advised during the Career Next-Steps and Promotions webinar that took place June 11. Li, who is chair and professor in the department of statistics at the University of Illinois Urbana-Champaign, joined fellow panelists Adrian Coles, who is a senior research scientist at Eli Lilly and Company, and Elizabeth Mannshardt, who is associate director of the US Environmental Protection Agency's Information Access and Analytic Services Division and an adjunct associate professor in the department of statistics at North Carolina State University. Coles and Mannshardt reinforced Li's advice during their presentations by providing examples from their career paths of the impact of service to the community on their career development.

The panelists followed different career paths and worked in different sectors, each providing unique and diverse experiences. Key takeaways include the following:

BO LI:

- Be open to collaboration. Even if a project is outside your area of expertise, take time to consider the opportunity.

- Don't be afraid to ask senior people for advice. The statistics and data science field is mostly friendly and that person you asked will often feel great helping others.

- Learn from, but don't dwell on, rejections and career frustrations. The saying, "What doesn't kill you makes you stronger," rings true in research. Learn from the experience, but don't let it hinder your growth.

- Be willing to work hard. You will often experience "pains for gains."

ADRIAN COLES:

- Listen to both your passions and your frustrations. Frustration is sometimes an emotional "flare" that alerts us to a problem that needs to be solved; it shines a light on an opportunity to contribute.

- Define your values and principles up front. Use them to guide your career path.

- Be adaptable, keep learning, and commit to holistic development. Part of the learning process includes improving our emotional growth, communication skills, leadership abilities, and business acumen.

- Invest in growing and managing relationships. Healthy, well-nurtured relationships are doorways to new opportunities.

ELIZABETH MANNSHARDT:

- Be curious and develop new expertise. You may discover new passions and interests.

- Advocate for yourself. Self-promotion is difficult, but you are your own best advocate!

- Develop your communication skills. Teach a class, talk to the media, or present your research to others outside your field. Practice makes perfect, and you learn new ways to communicate your ideas when considering diverse perspectives.

- Follow your heart. In the end, you should follow your heart. Work toward something that makes you happy.

After the presentations, the panelists responded to questions from the audience. Advice from the Q&A included the following:

- Look for opportunities to communicate both formally and informally, including opportunities provided by professional organizations.

- Career advancement requires alignment with the vision and mission of your organization.

- Become comfortable describing how you are contributing to the success of your organization.

- Understand your organization's system and the logistics of what it takes to be promoted.

- Keep your mentors and sponsors informed so they know what you want and are able to advocate for you.

- Take time to write down your goals and how you are making progress.

The panelists all agreed that investing in growing your community is essential. As part of that community, the Committee on Career Development is committed to helping you, so reach out at *https://community.amstat.org/ccd/home.* ∎

Get to the Decision: Briefing Analysis in the Pentagon

Col. Charles W. Weko, Chief, Command & Installation Program Analysis Division,
Army Program Analysis & Evaluation

Analysis must clearly support decision-making and be easily consumable for busy Pentagon executives.

Do not mistake this to mean analysts have to "dumb down" their product. Instead, analysts have to grasp the intense cognitive demand Department of Defense executives experience. Analysts must limit the amount of unnecessary additional load they place on these executives.

Understand the Environment

The Pentagon workforce manages the corporate functions of the largest single organization in the world. A host of general officers, senior executive service employees, and political appointees make up the executive military cohort. These executives are faced with countless multibillion-dollar decisions. They must craft policies that affect the lives of millions of services members. Plus, they have to navigate an ever-evolving political landscape.

None of these decisions is simple. What is more, anticipating the interactions between decisions is a daunting task. Many people will warn of second- and third-order effects, but actually identifying those effects in advance and incorporating them into decision-making can be contentious.

Additionally, time demands are routinely unreasonable. Many military executives struggle to fit basic daily tasks into their schedules. Excruciatingly long workdays are the norm for most military executives. Simply finding time to exercise, eat, and even go to the bathroom can be an unpredictable task. One might expect that senior military executives can do whatever they want, but as the saying goes, "There is always a bigger fish." The congressional and administration leadership has little patience for delay.

Against this backdrop, it is hard to overstate the cognitive demands on military executives. They are forced to hop from topic to topic. They must compress meetings and squeeze out any wasted time. They have to focus themselves and others on the most important issues and avoid getting sidetracked.

For an analyst, the ability to provide results that directly support decision-making and communicate those results is vital. The analyst who can provide tangible results is a rare and prized teammate. Those who cannot structure their information for rapid absorption are relegated to the unimportant tasks.

Focus on the Decision

The key to successfully briefing a Pentagon executive is focusing on the decision the analysis supports. What is the problem that requires the executive's attention, and what actions can the executive take to address the problem?

First, let's be clear about the word "briefing." Briefing a military executive is a highly interpersonal experience. Unlike in a classroom or at a conference, the military executive is in control of the pace, focus, and questions asked. There is no need to tell a military executive it is okay to ask questions—they know and they will.

Second, the military generally has two kinds of briefings: a "decision brief" and an "information brief." The fundamental difference between these is that a "decision brief" explicitly presents a problem with potential solutions while an "information brief" does not propose an explicit decision. The only reason a military executive ever takes a brief is to support a decision. They may not be personally making the decision, but they are likely concerned about the effects of someone else's decision on their responsibilities.

There are three basic questions an analyst should use to keep themselves and the executive focused on the decision. The briefing materials don't need
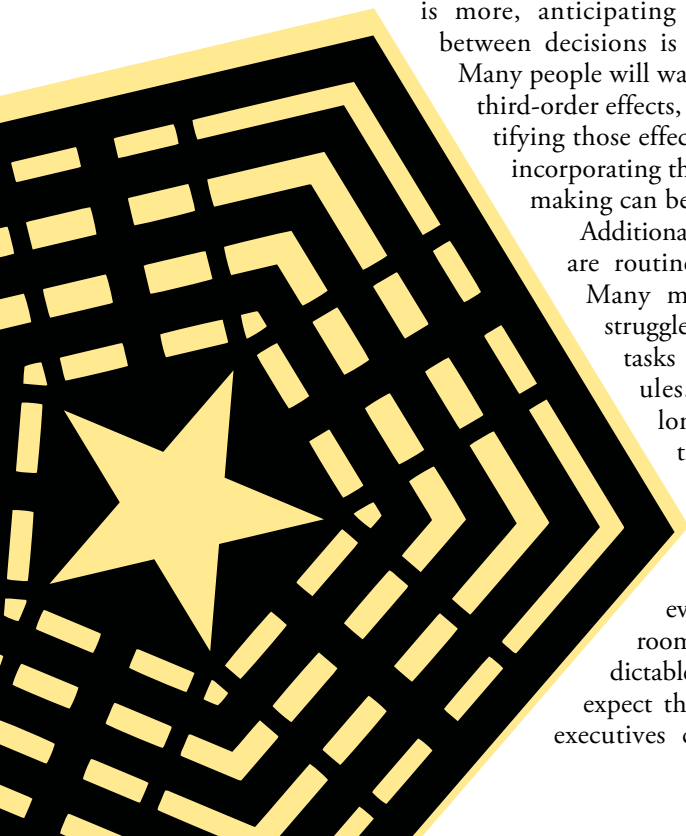
> Resist the urge to say, "It's complicated." Of course it's complicated; that's why we pay an analyst to sort it out.

to answer these questions, but the analyst should be prepared to talk about the following issues:

What decision does this analysis influence?

Know the explicit decision the analysis supports. Even if you are providing preliminary analysis that might be called a "proof of concept," be prepared to clearly link the work to a decision the executive faces.

How does this information help me make the decision?

The executive may not immediately see how to use the analysis to make decisions. Be prepared to directly link the analysis to a decision using a historical example. For example, "In the past, when the widget rate rose above 15 percent, we saw a drop in wocket production. If we want to keep wocket production stable, we need to take action to keep the widget rate below 15 percent."

So What?

This question is a favorite of frustrated executives. Every analyst should be prepared to respond to it. The key to responding is understanding the executive is really asking, "Can I just ignore this analysis?" An unfortunate number of analysts wilt in the face of this question. They worry that if their analysis doesn't directly shape the decision, they are not adding value. However, in many cases, being able to say some set of data doesn't affect a decision actually makes the decision-making process clearer.

Finally, even though the focus of a briefing should be a decision, don't be disappointed if a decision isn't made immediately following the brief. Executives will often seek input from multiple sources before deciding. They will often "preserve decision space" by delaying a decision so they can collect more data or work toward a consensus.

Communication Solutions

By the time an analyst briefs a military executive, the analyst has often spent a great deal of time working with their data and the policies affecting it. The depth of knowledge the analyst develops is valuable to the organization; however, the military executive will never be able to understand it as deeply as the analyst. Therefore, the successful analyst will focus on what needs to be communicated.

Resist the urge to say, "It's complicated." Of course it's complicated; that's why we pay an analyst to sort it out. More importantly, this kind of introduction sets up barriers in the executive's mind as they anticipate not being able to understand what is coming. Instead, begin with, "This is straightforward, but there are a few nuances to be aware of." Then explain the straightforward part. Add complexity only once the fundamentals of the decision are clear.

In most cases, the "nuances" will be different points of view held by other offices. The decision becomes convoluted by competing interests. Keeping these interests explicit helps keep the analytical portion of the brief straightforward and gives the executive opportunities to navigate the interpersonal aspects of the decision.

When you structure your presentation, focus on walking the executive from the problem to the decision without presenting your personal journey through the data. The executive only needs to be briefed on what they need to know. If the analyst tried different approaches that didn't yield results, the executive doesn't need to know those details. One exception to this advice is when the analyst is explicitly asked to perform a specific approach. In that case, acknowledge the attempt, but spend only as much time on explaining the results as the executive wants.

Analysts may have less time to give their presentation than they expect. At the beginning of a 30-minute session, the analyst may be told they only have 15 minutes to give their presentation. Many analysts embarrass themselves by talking twice as fast. Instead, take a deep breath, introduce the problem for decision, jump immediately to the recommendation based on the analysis, and then ask the executive what questions they have.

Creating analysis that clearly supports decision-making and is easily consumable for Pentagon executives may initially seem daunting. However, empathy for the executive's working conditions, a focus on the decision to be made, and a willingness to limit the amount of analysis presented can make all the difference in the world. Not only does the successful analyst become more valued in the organization and decision-making become more effective, but they improve the quality of life for those around them. ■

How to Publish in *CHANCE* Magazine

Amanda Peterson-Plunkett, *CHANCE* Executive Editor

"Using data to advance science, education, and society" is the tagline of *CHANCE*, a peer-reviewed magazine co-published quarterly by the ASA and Taylor & Francis Group. It represents a cultural record of statistics as an evolving field, intended to inform and entertain.

The first magazine was published in 1988 under the direction of William Eddy and Steven Fienberg. More on the birth and history of the magazine can be found in a 2013 interview with Eddy and Fienberg: "Taking a *CHANCE*" (*https://bit.ly/3fTLAiC*). Additionally, a large number of already-published articles are online at *https://chance.amstat.org*

The success of the magazine depends on engaging articles. Writing for *CHANCE* is a great way to share interesting applications and the latest advances in statistics and data science. Keep reading for information about submitting an article.

Writing and submission: Authors are encouraged to write with a relaxed, expository style; opinion, humor, and historical comments can (and should) be intermingled to make for lively reading. Articles can be submitted online at *https://mc.manuscriptcentral.com/ucha*. Be sure to apply the advice provided on the *CHANCE* "Submit an Article" page (*https://bit.ly/3s4RKBD*). Also, see the author resources provided by Taylor & Francis (*https://bit.ly/2U7UoKh*).

Development of an initial idea or rough draft: If you have an idea but are not sure if it is a good topic for *CHANCE*, submit the idea to the executive editor for feedback. Or maybe you already have a good idea or rough draft but are not sure how to transform it into an engaging article. For example, this may be your first time publishing, or maybe you need help polishing the language as a non-native English speaker. Maybe you just need help getting started. In these cases, our developmental editor can help. Email the executive editor at *chancemag.editor@gmail.com* to get started.

Special issue development: If you are a leading expert in your field, we would love to partner with you for a special issue of C*HANCE*. It is an opportunity to showcase work in your field to a broad audience. Given your vast network of experts, we will rely on you to invite papers and assist in reviewing specialized content. Recent special issues include topics such as clinical trials (*https://bit.ly/3CBrYK1*), data privacy (*https://bit.ly/37BiT5H*), and the use of statistics for doing good (September 2021 issue). Email the executive editor at *chancemag.editor@gmail.com* to discuss ideas.

Peer review and publication: After submission, your article will be screened to ensure all necessary items are included. The executive editor will make an initial determination of relevancy (i.e., it is of topical interest to *CHANCE*). Next, the article will be sent to an editor for review and comments. Editorial recommendations include "accept," "minor revision," "major revision," or "reject." If revision is requested, be sure to address all the provided feedback. Finalized revisions will be passed to the executive editor for acceptance and placement into an issue. At this time, a short biographical paragraph is required, which will be included with the article. Approximately two months prior to publication, your article will be sent to the publication team for copy editing. A month later, you will receive a proof, at which time you may suggest minor edits. Due to the volume of submissions and limited space, we unfortunately are not able to accept all submitted articles, but we appreciate all submissions!

Published articles: Once the article is published, congratulate yourself and enjoy sharing it with your colleagues, family, and friends. In the "Authored Works" section of your account on Taylor & Francis Online (*www.tandfonline.com*), you will be able to access information about your article, download the PDF, view the HTML version, and access your free eprint link.

I hope you will consider joining our growing list of authors. Follow us on Twitter (@ChanceStatsMag) for the most up-to-date information and news.

ASA members can view articles for free by logging in at *www.amstat.org* and navigating to "My Publications." *CHANCE* magazine is also available in print form. ASA members can select it as a publication when renewing their membership. ■

10 TIPS
for Communicating at Virtual Conferences

In the past year, we have had to make many adjustments to our personal and professional lives. Many of us have adjusted to working from home full-time, and we are also adjusting our expectations for career-building and networking events such as conferences. It is increasingly evident that virtual conferences are going to stay with us long after everything is "opened back up" or "back to normal." As we navigate this new digital world and new ways to share our work, here are some tips to make the most of your virtual conference experience as a presenter and attendee.

Samantha Tyner is a data scientist at Tritura Information Governance, LLC. She is also an applied statistician with interests in data visualization, forensic science, machine learning, text mining, and network analysis. She earned her PhD in statistics from Iowa State University in 2017. You can follow her on Twitter at @sctyner.

FOUR TIPS FOR SPEAKERS

1 Get Your Tech Right in Advance.

Your computer setup is by far the most crucial key to success at a virtual conference. If your material is amazing, but you're having technical issues, your presentation will suffer. Here are a few steps you can take to ensure success with your tech:

- **Use a headset with a microphone.** You will sound clearer, there won't be any echoing, and you will hear better. The headphones that came with your phone will work just fine, so long as they have a microphone built in. You can also get a headset with a USB port.

- **Make your presentation full screen.** Your presentation will be shared to other small screens, not projected onto a large surface, so you must make your slides full screen. See Table 1 for keyboard shortcuts to make your slides full screen on various systems and using different software.

- **If you use presenter notes, you will likely need to clone your slides, displaying the slides to the audience while you see your notes.** Some programs such as Zoom do this automatically with the most recent version of PowerPoint. If you're going to use presenter notes, make the conference staff aware in advance so they can help you set it up.

Unfortunately, there is not much you can do about your internet connection. Just do your best to connect to a network you know is reliable.

2 Have a Good Background

If you will be on video, it is best to have a neutral background with limited distractions. Avoid "fun" backgrounds, though I do like the blurred background effect some services have. There should not be light coming from behind you. For attendees to best see you, the light source should be coming from in front of you.

3 Look into the Webcam

Just like during an in-person presentation, you want to present to the audience, not to your computer. The audience sees you through your webcam, so look into it occasionally. This will help your audience feel more connected to you and your material.

4 Good Presentation Rules Still Apply

Some of my favorites are the following:

- Minimize text, equations, and code on the slides.

- Ensure any text you keep is large enough to be seen on a small screen. Many attendees will be watching with their laptops, phones, or tablets—all with much smaller screens than a traditional desktop setup. Make the text on your slides a bit larger than you think is necessary.

- Any plots, graphs, or other visuals should also be clearly readable on a small screen and have large labels.

- Follow the rule of thirds (*https://en.wikipedia.org/wiki/Rule_of_thirds*).

- Speak more slowly than you think you should. In the moment, your speech will almost always speed up.

- Don't forget to breathe!

SIX TIPS FOR ATTENDEES

1 Make a Plan

When attending a conference from home, your attention will be pulled in many directions. The virtual conference may also have a number of concurrent sessions, just like an in-person conference, so there will be many sessions you want to see. Navigating the online conference system without having a plan could cause unnecessary flustering, so it's best to know what sessions you'll be attending ahead of time.

2 Be Present

Do your best to be present during talks. To get the most out of them, give them your full attention. Eliminate distractions wherever possible: Silence your phone, your smartwatch, and your email notifications. Also, inform your living companions you won't be available for a short time.

Above all, do not do other work while watching a virtual talk. It's tempting but avoid this temptation! If you do have to work, close the conference window. It will still be there when your work is done.

3 Move!

During an in-person conference, there is usually some shuffling between rooms every 40–60 minutes or so. You should aim to keep this up during a virtual conference. Get up every 40–60 minutes and take a five-minute break. Get up from your computer. Stretch. Walk around. Do yoga. Make a cup of coffee. Do anything that gets you up from your computer and away from screens for five whole minutes.

4 Set Yourself Up for Success

Figure out the best setup for you ahead of time. When working from home, this can be tricky. If you like to take notes, make sure you have a comfortable space in which to write and watch the talk. If you will use headphones to listen, test the sound in advance.

5 Practice Good Virtual Etiquette

Depending on the conference system, you may be seen and heard during the conference. Unless the speaker specifically requests otherwise, always turn your sound and video off. At an in-person conference, it is obvious who the speaker is based on their position in the room. During a virtual conference, this cue goes away: We are all little squares on the screen. Don't distract from the speaker by leaving your sound and video on.

6 Protect Your Time and Health

Your time and health are incredibly valuable. Don't let attending a conference, virtual or otherwise, detract from that. Whether you are a work-from-home pro or are still adjusting, don't put pressure on yourself to attend every virtual conference session. Now that you can access more conferences than ever with no travel required and low registration fees, you may be tempted to attend more than you would before the pandemic. Please don't try to attend them all. Choose wisely.

Finally, try to make sure you're getting enough sleep. Don't get up super early or stay up super late for a conference in a wildly different time zone. ∎

Table 1: How to Enter Full-Screen/Presenter Mode When Giving a Presentation with Your Preferred System and Software

Program	MAC		WINDOWS		LINUX	
	Enter fs	Exit fs	Enter fs	Exit fs	Enter fs	Exit fs
PowerPoint	Cmd+Shift+Return	Esc	F5	Esc	F5	Esc
Keynote	Opt+Cmd+P	Esc, Q	--	--	--	--
Google Chrome	Ctrl+Cmd+F	Ctrl+Cmd+F	F11	F11	F11	F11
Firefox	Cmd+Opt+P	Esc	F11, Ctrl+Alt+P	F11, Esc	F11, Ctrl+Alt+P	F11, Esc
Preview / Document Viewer	Ctrl+Cmd+F, Shift+Cmd+F	Ctrl+Cmd+F, Esc	--	--	F5	Esc
Adobe Acrobat Reader	Cmd+L	Esc	Ctrl+L	Ctrl+L or Esc	--	--
Google Slides	Cmd+Return	Esc	Ctrl+F5	Esc	Ctrl+F5	Esc

fs = full screen

Communicate Statistics, **Engage Students with Personal Experiences**
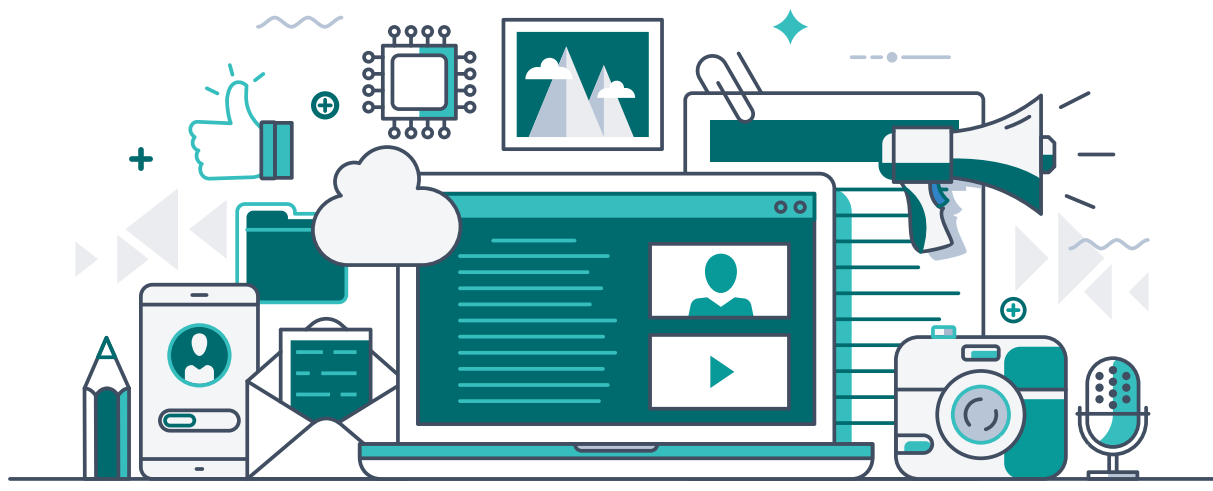
During travels or at social events, I inevitably run into someone asking me about my profession. When I say I am a statistician, the reactions often include the following:

- "Oh my!"

- "I once took a statistics course. It was very difficult."

- "That must be so boring."

Such comments are despite the ubiquitous nature of statistics in our lives.

We constantly engage with data in numerous forms—checking time, commuting distance, education, national and international policies, sports, entertainment, health decisions, phone calls, internet use, and more. Statistics—which is the science of collecting, analyzing, and interpreting data—occurs naturally in our daily lives. Yet, the term statistics as a profession elicits the above comments. These and many other personal experiences continue to influence my efforts to communicate statistics in my introduction to biostatistics class.

Over the years, I have come to appreciate that enthusiasm for statistics varies. Therefore, I resort to diverse strategies when explaining the results of my statistical analyses and research to my collaborators from other disciplines. Some prefer a quick message about the outcome of a hypothesis test for a project's primary aim. Others favor detailed tables, figures, and perhaps an infographic. And some go over my summary alone for a few days and then reach out for discussion. People process statistics in many ways, with different tools, and in different environments.

This understanding stood out for me when I was invited to develop an introductory statistics course for early-career cancer biomedical researchers. How do I communicate statistics to an audience from a different discipline, especially when I know people process statistics in different ways? I did not have an answer. But I decided to give it a try using my personal encounters with data as the building blocks for this effort. Today, I adapt this approach for my class.

I learned how statistics shapes and is shaped by other disciplines while a graduate student in the department of statistics at the University of Wisconsin-Madison. I especially understood many ideas behind experimental design have their roots in agriculture. The Monday evening seminars organized by George Box demonstrated the significant role of experimental designs in the automobile industry. As a nod to this history, I use agriculture data on corn yield, the motor trend car road tests data set, and the New York transportation fuels data from Kaggle to motivate types of variables, statistical summaries, data visualization

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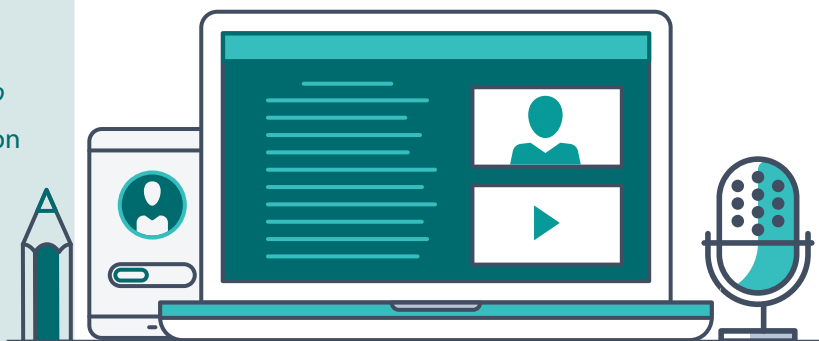
MORE ONLINE
For course materials, visit the ASA's Section on Teaching of Statistics in the Health Sciences blog at *https://bit.ly/2U7GEPw*.

tools, and hypothesis testing in my class.

It is over casual chats with friends pursuing graduate degrees in medicine and public health that I learned Florence Nightingale, the founder of modern nursing and a major public health figure in the 1800s, was also a statistician and proponent of data visualization. The book racks of Steenbock Library for Agriculture and Life Science and Memorial Library revealed many other gems, including Janet Lane-Claypon, an English epidemiologist who pioneered the use of case-control and cohort studies, and Edith Abbott, an economist and statistician who wrote a groundbreaking report in 1915 on crime statistics in Chicago. The lives and works of these women are particularly relevant in a (bio) statistics course for researchers in public health and medicine. I incorporate videos, blog posts, and podcasts about these prominent women to provide a refreshing learning environment.

After moving to the East Coast, rail commute highlighted the foundational role of statistical uncertainty in my daily life. How likely is it to rain today in New York City? The newspaper reports 75 percent chance of rain. Does it mean it will rain in 75 percent of the area of New York City? Or will it rain today in New York City for 18 hours, which is 75 percent of 24 hours? Or will it be raining 75 out of 100 times I step out? Or will there be rain 75 times out 100 on days like today? Why is a percentage so confusing? Podcasts offer unprecedented opportunities for in-class conversations to better understand statistical terms used in our daily life. Several episodes of the BBC Radio 4 podcast, More or Less, are integrated into many topics in my course, including discussions about chance and percentages.

Rail commute also introduced me to meetups such as R Ladies NYC, opening the door for nonfiction books. Of note is *Dear Data*, a book of 52 postcards by Georgia Lupi and Stefanie Posavec describing their lives in data and highlighting how everyone can become a data collector. When a student approaches me expressing a fear of statistics, I encourage them to read at least some of the postcards in this book. The response has been overwhelmingly positive, with students reporting more confidence in engaging with statistics courses.

How a course is structured is another dimension of statistics communication. Two years ago, Sujata Patil—currently at the Cleveland Clinic Foundation—and I started to develop an introductory statistics curriculum with National Institutes of Health support. Recognizing that people consume data and process statistics in different ways, we planned a curriculum using the flipped classroom approach that allows one to learn at their own pace, with a significant portion also taking the form of "learn by doing." Flipping the classroom has allowed me to incorporate several personal experiences with data—summarized above and also available through the ASA's Section on Teaching of Statistics in the Health Sciences blog—into my course materials at Rutgers School of Public Health.

Data is fundamental. A statistics course offers the conceptual foundations in quantitative reasoning to extract meaningful information from data in a responsible manner. But many—in social settings and in the classroom—find statistics daunting. To allay these fears and promote data and statistical literacy, I would like to issue a call to action for communicating statistics using data that are part of our daily lives. ∎

STAT*tr@k*

Federal Statistical Positions:
What You Need to Know
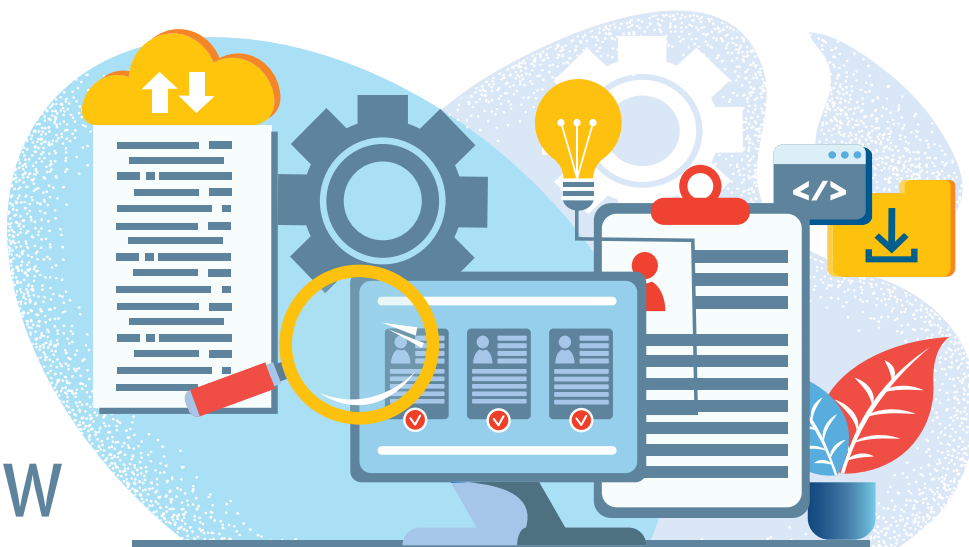
The federal government is always looking for talented and innovative people with mathematical and statistical education and experience to assist the various organizations within the federal statistical system (*https://bit.ly/37wQSw9*) in meeting their missions and organizational goals.

We understand finding and applying for federal statistical positions may be overwhelming, so below are some helpful resources and information.

What agencies have statistical positions?

Statistical positions are found across the federal government and are not unique to any one agency. In fact, according to a White House document, *Principal Statistical Agencies and Recognized Units,* "[T]he Federal statistical system comprises over 125 agencies or units that engage in statistical activities. A substantial portion of our official statistics in the United States is produced by the 13 agencies that have statistical work as their principal mission. In addition, 3 statistical units (subcomponents of agencies) are recognized as having statistical work as their principal mission."

Having 125 agencies across the federal government allows for many employment opportunities. One just needs to decide what their statistical interests are and search for vacancy announcements for the type of position they want (e.g., permanent, temporary, paid/unpaid, benefits/no benefits, etc.). within those agencies.

What types of statisticians are typically found at a federal statistical agency?

There are three types of statistician positions within the federal government: Mathematical statistician (GS-1529), survey statistician (GS-1530), and statistician (GS-1530).

A mathematical statistician designs, develops, and adapts mathematical methods and techniques to statistical processes such as probability, statistical estimation, data analysis, survey design, questionnaire design, sampling theory, methodological research and development, and statistical and mathematical modeling.

A survey statistician establishes survey specifications such as data content, collection, and dissemination; instrument design; analysis; and modifying systems design.

Finally, a statistician applies statistical theories, techniques, and methods to gather, analyze, interpret, and/or report quantified information. Statisticians can have specialty parenthetical titles such as agriculture, biology, demography, economics, education, engineering, health, medicine, operations and administration, social science, and data science.

A description of each parenthetical can be found in the Office of Personnel Management's (OPM) Job Family Standard for Professional Work in the Mathematical Sciences Group (*https://bit.ly/3scS1m6*).

Shirleta C. Washington is workforce and career development staff chief at the National Center for Health Statistics Office of Management and Operations.
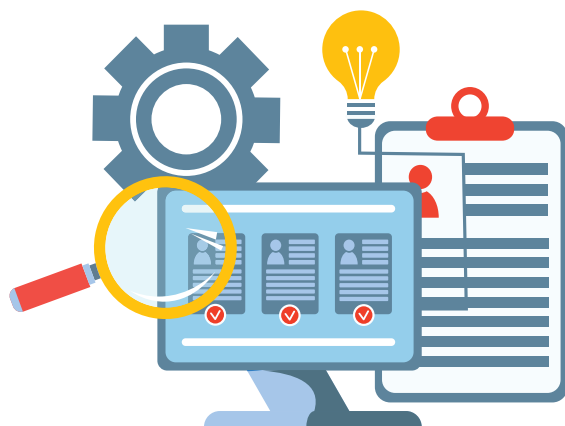
Does an applicant's degree have to be in mathematics or statistics?

No, to qualify for a mathematical statistician position, applicants must meet the basic requirements for Mathematical Statistician, GS-1529 (*https://bit.ly/3xH424d*) as defined by the OPM. To meet basic qualifications for a survey statistician or statistician (or a statistician with a specialty) position, applicants must meet OPM's Statistician, GS-1530 (*https://bit.ly/3s7yTG3*) requirements.

Are there entry-level and senior-level statistical positions?

Yes, each statistical position, regardless of the GS series (i.e., 1529 or 1530) is associated with a grade ranging from GS-5 to GS-15. In addition to basic education requirements outlined above, applicants must also meet the minimum grade qualifications outlined below:

- **GS-5** requires a four-year course of study leading to a bachelor's degree.

- **GS-7** requires one year of graduate-level education *or* superior academic achievement or one year equivalent to at least GS-5.

- **GS-9** requires two years of progressively higher-level graduate education leading to a master's degree, a master's, an equivalent graduate degree, or one year of specialized experience equivalent to at least GS-7.

- **GS-11** requires three years of progressively higher-level graduate education leading to a PhD degree, a PhD, an equivalent doctoral degree, or one year of specialized experience equivalent to at least GS-9.

- **GS-12 through GS-15** require one year of specialized experience equivalent to at least the next lower grade level.

In all cases, specialized experience is that which is directly related to the position and has equipped the applicant with the knowledge, skills, and abilities (KSAs) to successfully perform the duties of the position (e.g., collecting data and conducting statistical analyses for publication).

What is the salary for each of the GS grade levels?

The exact salary will vary based on the location of the position. For example, the salary of a statistician in San Francisco, California, will differ from the salary of a statistician in Raleigh, North Carolina. Applicants are encouraged to check the salary range outlined in the agency's vacancy announcement. OPM also publishes annual locality pay tables, including the 2021 General Schedule (GS) Locality Pay Tables (*https://bit.ly/3iDnCtI*).

How do I find statistical positions?

Most agencies advertise their statistical vacancies on OPM's USAJOBS (*www.usajobs.gov*). USAJOBS is the federal government's official employment site and central place to find most federal employment opportunities. As stated on OPM's website, "USAJOBS is used to help recruit a world-class government workforce across the United States and around the world."

In addition to checking for vacancies on USAJOBS, potential applicants should also check LinkedIn and individual agency websites such as Careers at CDC (*https://jobs.cdc.gov*), because agencies will often highlight their job fairs and mission critical and hard-to-fill positions. Many agencies have special hiring mechanisms (e.g., fellowships, Commissioned Corp., Intergovernmental Personnel Act, etc.) that are unique to the particular agency.

Potential applicants are also encouraged to check LinkedIn and individual agency websites for fellowship opportunities, as these may not be found on USAJOBS. In these cases, make sure you follow the specific instructions for applying (e.g., submitting recommendations, essays, project proposals, etc.). While not a federal position, many agencies also offer paid internship experiences through the ORISE program (*www.zintellect.com*). Some agencies may also offer paid/unpaid student volunteer opportunities.

How do I apply for a statistical position?

Applying for a federal vacancy on USAJOBS is relatively easy. OPM has outlined the USAJOBS application process in the following six steps:

Create an account with *login.gov*

Create a USAJOBS profile

Search for jobs

Review job announcement

Prepare your application in USAJOBS

Submit application to agency

Once your application is submitted, the agency—not OPM—will review your application, schedule interviews, select candidates, and then provide a job offer. OPM offers step-by-step instructions for completing an application (*www.usajobs.gov/?c=fed-app-process*), hiring myths (*www.usajobs.gov/Help/working-in-government/myths*), and FAQs (*www.usajobs.gov/Help/faq*). Applicants are strongly encouraged to review these tools and the USAJOBS Help Center (*www.usajobs.gov/Help/faq/application/process*) before starting the application process.

What are some tips to keep in mind when preparing a federal résumé?

Your résumé should be written to meet the specific needs and requirements of each vacancy announcement. If the vacancy announcement requires specific coursework, list the coursework and indicate semester or quarter hours for each. Use action word phrases. You'll also want to ensure that your federal résumé contains required information such as the following:

Name of agency/organization

Job title—be sure to include relevant paid and non-paid experience

Start and end dates (including the month and year)

Number of hours per week

Salary per annum/week

Description of relevant work experience and accomplishments that demonstrate you can perform the duties of the position

The school, college, or university you attended; the location; the degree; date received or expected; and GPA

Reasons to Work for the Federal Government

- ✓ Competitive salaries
- ✓ Various health insurance options
- ✓ Life insurance
- ✓ Health savings account
- ✓ Retirement plans
- ✓ Public transit subsidy
- ✓ Telework
- ✓ Alternative work schedules
- ✓ Annual, sick, and family leave
- ✓ 11 paid holidays

Remember, when describing work accomplishments, be specific and precise. You'll want to give detailed examples of work you've performed, including the level of experience. For instance, whether you served as a project manager or team member helps illustrate your level of experience. When preparing a summary of your work, get to the point and don't ramble. Present yourself in "clear and plain" language. And most importantly, do not use acronyms or generic language from a position description.

How do I make sure the process goes smoothly?

Read, read, and re-read all the application instructions. Assume each vacancy announcement is different. Make sure you keep your résumé updated and tailor it to each vacancy announcement.

You'll also want to include all required documents listed in the vacancy announcement such as an SF-50s or performance plan if you previously worked for the federal government, transcripts for all degrees, DD-214 if you are applying as a veteran, disability letter if you are applying as an individual with a disability, etc.

Pay attention and adhere to vacancy announcement deadlines; most announcements close at 11:59 p.m. on the specified date.

If you have questions or are unsure about a step during the application process, call the point of contact or help desk listed in the vacancy announcement. The Human Resources Office for the agency is there to assist applicants with the application process. ■

STATS4GOOD

Saving Endangered Languages with
AI and the Science of Communication

With a PhD in statistical astrophysics, **David Corliss** is lead, Industrial Business Analytics, and manager, Data Science Center of Excellence, Stellantis. He serves on the steering committee for the Conference on Statistical Practice and 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.

One of the greatest allies in communicating better in the sciences is science itself. Research in communication, learning, neurology, and more contribute tremendously to understanding how language works and is understood and retained.

As a person who was completely non-verbal for more than three years and struggled to acquire language after being so long delayed, I can speak personally to the impact the science of communication has had on so many lives. Even as this research has helped some gain language, it is also being used to help others at risk of losing their language—and data, analytics, and AI are playing an increasingly important role.

In the past few years, advances in voice recognition and natural language processing have allowed verbal computers to go from visionary to kludgy to commonplace. Enabled by research in the science of communication and data science, AI now plays an important role in understanding language. Chatbots are widespread and becoming more so every day.

One application for this technology is learning new languages and analyzing words and patterns to create a digital—and therefore durable—version of the language, independent of human speakers. This allows rare languages to be digitally captured where native speakers are available, preserving the languages. Using AI to save a threatened language from extinction can save the culture itself.

Of the almost 7,000 languages spoken in the world, as many as 90 percent could disappear in the next 80 years. UNESCO—the United Nations Educational, Scientific, and Cultural Organization—has created an interactive map of threatened and endangered languages (*www.unesco.org/languages-atlas/index.php?hl=en&page=atlasmap*). Many are of local, native peoples overrun by outside languages and cultures as indigenous societies disappear. Today, a number of D4G organizations are creating projects and resources to help save these languages from extinction.

Google's Woolaroo project is a leading example of how technology can be used to save endangered languages. A great example of Data for Good supported by the private commercial sector, this not-for-profit platform provides ground truthing—verified recognition of an object—using a smartphone camera. The technology combines Google Cloud Vision, based on object recognition in the human visual cortex, with AutoML classification algorithms. A photograph of an object is combined with the word for it in the language being preserved. Because it's open source, anyone can contribute. Starting with Louisiana Creole, Woolaroo now covers 10 languages, including Yugambeh—an aboriginal language in Australia that had just one remaining native speaker.

Hello, CHATBOT!

Getting Involved

In opportunities this month, it's time to think ahead to next year's internships. The fall recruiting season is about to begin, with classes back in session. This affects people in occupations across the analytic spectrum. Personally, I'd love to see more community services organizations get a data science intern for the summer. For example, to help find more supporters, volunteers, and financial contributors! Having a Data for Good community service project as an option for interns can go a long way toward attracting top talent.

Learn more and start contributing on their GitHub site (*https://github.com/GoogleCloudPlatform/woolaroo-language-learning-app*).

Another Data for Good organization saving cultures by saving languages is OBTranslate. Like many translation services, the business side of the company charges fees to translate documents between many languages. Meanwhile, the D4G side of the operation crowdsources contributions from a volunteer community of statisticians, data scientists, language experts, and native speakers. Focused on African languages, the community helps create algorithms and data sets for more than 2,000 languages. OBTranslate also partners with university research teams to develop translation AI.

Both Google's Woolaroo and OBTranslate offer opportunities for Data for Good volunteers to get involved in saving cultures and saving languages with AI.

A central theme for this column is the many ways people work to "Solve the equation—Save the world!" Because a society's culture is contained and preserved in its forms of communication, saving endangered languages is one of the most compelling Data for Good stories at a human level. The loss of a language really amounts to a kind of extinction—an entire culture gone from the face of the Earth.

Of course, the best time to save languages is before they are so endangered that there are so few remaining speakers to be found a sample may not be representative. This shows another way statisticians can make a critical difference. Helping save a culture by saving its language takes more than coding. It also takes an understanding of sampling, missing data, and how to identify and mitigate bias. These core statistical skills are every bit as necessary as the ability to write algorithms, and that makes statisticians a vital part of the team.
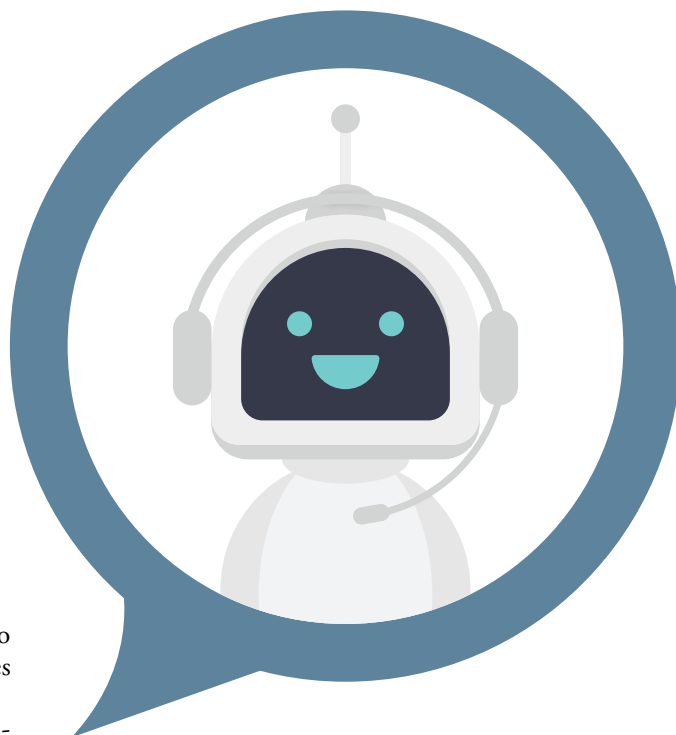
Our planet is a world of worlds, each unique and worth saving. With thousands of languages at risk and a growing number of organizations working to preserve them, the ways to get involved and possibly save someone's world are almost endless. ■

Q&A

The following individuals write and communicate statistics every day, so we asked them to give us their best writing tips, communication advice, and reading inspiration.

Aparna Nathan

Harvard University PhD Candidate

2021 AAAS Mass Media Fellow at the *Philadelphia Inquirer*

Writing about science and statistics: Is it an art or a craft?

Might be a sneaky answer, but it's both! I think there are concrete techniques that you can use to write about science and statistics well, including article structures, analogies, and tone that help the reader follow the story. In that sense, it feels like a craft. But at the same time, some of the best science writing innovates beyond those basics to make a piece more evocative. There might be a more creative way to describe how an animal moves, or a more compelling comparison for a stat. These make a story not only educational, but also fun—which is just as important if you want your reader to stay engaged with your message.

What's one trait you need to be a good communicator?

More than being a good speaker or writer, you need to be a good listener. As a journalist, I spend much more time listening to other people than actually writing, and I always have to be listening actively to make sure that I am filling in the gaps in my own understanding before I communicate the topic to someone else. I think this is also true in any kind of communication. Listening also helps you stay open-minded. Otherwise, it's easy to communicate without ever questioning your own biases and how you're imposing them on others.

What's your top tip for breaking writer's block?

If I'm stuck, often I'll just step away from my computer and narrate the concept I'm trying to write about out loud to myself. Saying things feels like it has lower stakes than writing them down, so this stream of consciousness helps me refine my ideas and how I present them.

Public speaking: Love it or hate it?

I definitely used to hate it, but now I enjoy it a lot more. (Would I say I love it? Not quite.) It was important for me to recognize that all the things I worried about—saying the wrong thing or forgetting what I wanted to say—were more about me than about my audience. Once I started defining a successful talk based on how well the audience engaged with the topic, it became a lot less nerve wracking because it felt like a conversation that both sides could benefit from.

Name one or two blogs or books you would recommend to others.

One that I've read: *Data Feminism,* by Catherine D'Ignazio and Lauren F. Klein. One that I'm reading currently: *Braiding Sweetgrass*, by Robin Wall Kimmerer. Both remind me that science and data are not divorced from the diversity—and inequity—of society. ∎

Diana Cai

2019 AAAS Mass Media Fellow at *STAT* News in Boston

Writing about science and statistics: Is it an art or a craft?

It's definitely a craft starting out. I can only speculate that it becomes an art with craft after a certain stage.

What's one trait you need to be a good communicator?

Being a good listener. There's a reason it's a cliché.

What's your top tip for breaking writer's block?

Going for a walk, conversing with a friend, maybe both.

Q&A

Public speaking: Love it or hate it?

I don't mind it.

Name one or two blogs or books you would recommend to others.

Hello World, by Hannah Fry, is a great dive into the ways algorithms impact our lives. *Being Mortal,* by Atul Gawande, provides a fascinating look into geriatric medicine and alternatives to our current system. ∎

Amy Nussbaum

Visiting Lecturer of Statistics, Mount Holyoke College

2016 ASA Science Policy Fellow

Writing about science and statistics: Is it an art or a craft?

I love this question! I've always heard the comparison of an art versus a science, and I definitely lean toward an art. But I really love the description of a craft as well—to me, that implies that you can hone your skills over a long period of time and really develop a variety of talents, both of which are true statements about communicating science and statistics, as well. I might have to borrow this description in the future!

What's one trait you need to be a good communicator?

Respect your audience! Over the course of my career, I've spoken with a lot of nonstatisticians—from policymakers to industry colleagues to students—and that tip has helped me every time. You might find yourself talking to someone who doesn't know what you know, but that rarely means they can't eventually understand what you have to say.

What's your top tip for breaking writer's block?

I really like having a writing routine. In grad school, I would come home from teaching and change into a favorite pair of comfy socks, make a cup of tea, and light a candle before I opened my laptop to work on research. To this day, I am ready to write when I smell that particular scent! It's a nice way of making yourself feel good about a task that you might be dreading.

Public speaking: Love it or hate it?

It's not my first choice—there's always some degree of nerves—but as my high-school swim coach used to say, "Nervousness is readiness leaving the body." It's perfectly fine to feel nervous about talking about something you're passionate about and getting it right for your audience!

Name one or two blogs or books you would recommend to others.

I am a big fan of reading for fun! Even reading novels can help shape your writing and communication styles. I just finished *Project Hail Mary,* by Andy Weir (who also wrote *The Martian*). If you're looking for a way to take a break from work, this was a really fun science fiction read you might enjoy! ∎

Jonathan Auerbach
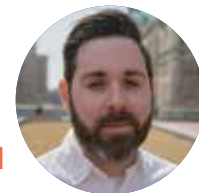
The American Statistical Association

2020 ASA Science Policy Fellow

Writing about science and statistics: Is it an art or a craft?

Writing is a craft learned by imitation and perfected by experimentation and revision. Science writing certainly has aesthetic value—as does any craft—but its primary purpose is communication. The effective writer communicates only the most pertinent information and in the least amount of space.

Q&A

What's one trait you need to be a good communicator?

Good communicators are engaging. They tell stories that are relevant to their audiences. A communication is a transaction where the audience pays with their time and, in our internet age, the competition for time is fierce.

What's your top tip for breaking writer's block?

First, determine if what you're writing is actually worth writing. If it is, sleep on it. I guarantee the offending sentence or paragraph is not the problem. Tomorrow, you'll realize that the actual problem was three paragraphs earlier. And if all else fails, ask a critic. Don't ask a friend. A friend will suggest cursory edits and then lie to your face and tell you it's brilliant.

Public speaking: Love it or hate it?

I dislike everything about public speaking. I'd much rather read a paper—where I can review the text and figures at my leisure—than attend a talk—where the speaker will cram too much information into too little space. I'm also convinced standing near a podium makes me dumber.

Name one or two blogs or books you would recommend to others.

I recommend [William] Zinsser's *On Writing Well* and [Steven] Pinker's *The Sense of Style.* ∎

Nick Thieme

Atlanta Journal-Constitution

2017 AAAS Mass Media Fellow at *Slate*

Writing about science and statistics: Is it an art or a craft?

Like any endeavor that, at one point or another is intended for public consumption, data writing is both an art and a craft, depending on which leg of the journey we're describing.

The portion of my daily work that's artistic roughly follows an hourglass shape over the life of a project. Forming an intuition about a slice of the world and solidifying an idea from that haze feels like an art that shifts every time I do it. From there, the work becomes more and more mechanical as I collect the building blocks of an article—my own data analysis, quotes from interviews, and other people's relevant research. Even some of the writing, the "nerd box," the structure of a news article, is more a craft than an art until, at the end, there's creative liberty again as I'm threading a narrative or framing the article within a larger body of academic work.

What's one trait you need to be a good communicator?

I once heard something along the lines of, "any person who is willing to write about themselves with total and complete honesty could not fail to produce a masterpiece," and I think that's exactly right. Complete and total honesty contains callousness and risk, and it isn't always healthy in daily life, but it is essential for public communication.

What's your top tip for breaking writer's block?

Discarding writer's block is the ultimate relief of viewing much of writing as craft, not art. Nothing feels right? That's fine; turn the crank anyway. A bad page is easier to turn into a good page than an empty one.

Public speaking: Love it or hate it?

I enjoy the interactive component of it. My writing is more faithful to my thinking than my speaking, so I think I'm less effective that way, but, at the same time, that's probably outweighed by the richness of collaborating.

Name one or two blogs or books you would recommend to others.

For popular statistics visualization, I'd say "Flowing Data" (blog). For more technical statistics, Andrew Gelman's "Statistical Modeling, Causal Inference, and Social Science" (blog). And then for a perfect example of fidelity in writing, Rita Indiana, *The Tentacle* (fiction book). ∎

Imposter to Expert: One Woman's Journey to Statistician

I will never forget when I looked out the window of my new office on the 10th floor that had my name on the door: Deliverance Bougie, Sr. Statistician. I knew I was an imposter. I knew my boss hired the wrong person and would realize his mistake any day. In fact, he probably already knew. In his office, he was shaking his head at this colossal mistake and waiting for my first blunder so he could dismiss me and hire the person he had intended to hire.

My journey into the field of statistics was unconventional. The highest level of math my high-school offered was Algebra II. I never received encouragement to further my education. In fact, I was told all the interests I had growing up—astronaut, accountant, veterinarian—would require too much education and hard work. The message I received was it was not even worth trying. As a result, I earned a BA in theology. Little did I know a fire would be lit in my soul nine years later to change my situation through further education.

The decision to go back to school was made out of desperation. Having worked in a variety of social services settings, I was good at what I did, but years of being used and abused had burned me out. Underpaid. Overworked. Unappreciated. People's lives were in my hands, and the recognition I received were a nearly minimum wage paycheck and an outline of a hand drawn on paper for a "pat on the back."

Something in me started to burn as I was working a midnight shift at a group home. The TV show *House* came on, and I watched as people flocked to Dr. House—the expert in his field. The ache to be an expert in something grew intense, but what expertise could I possibly achieve?

While searching through college programs to see what interested me, I remembered one of my favorite high-school classes was accounting. I came across something a little different: statistics. I did not know much about statistics, but I had once wanted to be an accountant. Surely the two were similar … right?

My search led me to a program that would allow me to earn a professional certificate in applied statistics in one year. Perfect! The country was in the middle of a recession, and I was living with my parents, paying off debt I had incurred from an international move, and working low-paying jobs. I did not have money and whatever I did would need a good return on investment as soon as possible, and I would need loans.

I began to work on the math prerequisites I would need at a community college. I had never even had geometry, so I had a lot of gaps to fill. I excelled in all these classes and loved STAT 101. During this time, I learned I could not count on student loans for the professional certificate, so I had to change plans and go for the degree. I was now ready to start the statistics program full of confidence and anticipation.

Struggling in School

I was not prepared for my first experience when I transitioned to the graduate program in Chicago.

Deliverance Bougie is the senior statistician for the State of Indiana Department of Local Government Finance. She is also a graduate student at the University of Mannheim, working on her master's in measurement and data science.

I had no guidance on where to start, so I registered for the classes available that semester: biostatistics and linear regression.

Regression started with the professor writing the simple linear regression formula on the whiteboard and saying, "You know this." I nearly fell out of my chair. In my head, I screamed, "I took three years of Greek and I know what beta is, but what does beta mean?!" Then, he proceeded with a bunch of gibberish about something I later understood were matrices. In time, I learned I really should have taken linear algebra, although it was not a prerequisite. Meetings during office hours were demoralizing, as the professor said things like, "You should know this. I told you this."

I poured my heart into my studies, desperate for this plan to work. Homework assignments that took my classmates five hours would take me 20. I traveled three hours each way by car, train, foot, and shuttle to my classes, spending 60–80 hours a week on my efforts toward a degree. But my struggle was not enough.

After earning 22 credits (and debt I am still paying off) toward a master's degree in applied statistics, I was kicked out of the program with a GPA of 2.637. I was in utter despair. It was not that I wasn't learning the subjects. I faithfully showed up for peer tutoring twice weekly, and I was even helping my classmates with their homework. I was baffled by my low grades on exams and quizzes. Eventually, I learned about test anxiety, and I was a textbook case. I felt intense pressure to perform well because failure meant plunging into deeper debt that would be impossible to pay.

Thinking I was not cut out for a scientific field, I began to internalize feelings of failure and doubt. But I knew I could do this! This apparent failure did not reflect who I was and what I learned. The doubt I felt from others fed self-doubt. I had worked harder than anyone else in my classes. The fire in me had dimmed to a low flame, but it was still flickering.

I knew I could not stop because I had gotten into debt I could not pay off with minimum-wage jobs and I needed to see this through. I earned a graduate certificate in applied statistics through an online program in two terms with a GPA of 3.75. It was then I realized the traditional classroom setting is not where I excel. I applied to their degree program but was not accepted. The little flame had grown, but I did not have the confidence to apply for any other programs.

Back to the Same Old

I continued to work multiple part-time jobs with social service agencies, unable to find anything else. I was either overqualified or underqualified. I landed yet another part-time job in a county office. Within weeks of this new job, I was put on the fast track to get all the certifications I would need to accept a full-time position once one became available. But it didn't work out that way; when the person who hired me left, I was passively bullied by his replacement. I interviewed for a full-time position that soon became available, but it was given to someone I had been training.

I learned about an annual process in which data had to be submitted to the state oversight agency for approval. I figured there must be some statistics involved and I could assist, as I was the only one in the office who had formal education in statistics. My request was denied. I felt stifled. I was once again good at what I did, but not allowed to use my talents. The self-doubt continued to grow, and I felt like a failure. I was working three part-time jobs, carrying a lot of debt, and being passed over for a promotion. I was not respected enough by superiors to contribute my expertise to the team.

One of my coworkers told me of an open statistician position at the state oversight agency that reviewed our data. I told him I would not even be considered for the job because I don't have a degree in statistics. He said, "Yes, you will! Just apply!"

I reluctantly applied and was called in for an interview. I did the interview solely to gain experience because I knew I would not be offered the job. Even if I was offered the job, I would not be able to take it because it would require relocation. To my shock, I was offered the position as senior statistician for the State of Indiana Department of Local Government Finance. My husband and I talked it

over, crunched some numbers, and decided this was a way for me to get a couple of years of experience. I accepted the position. I really didn't want my first job in a new career to be working as a sole statistician, but this was a way I could finally get a foot in the door.

Alone and Facing Opposition

I had no idea how utterly alone I would feel with no one to consult with or learn from. As I wrestled with the application of statistics to property assessment, I began to learn property assessment subject matter experts who were statisticians were not common. I also quickly learned there was some hostility toward the oversight agency, specifically toward the statistician.

I deal with opposition from stakeholders frequently. They (admittedly) do not understand statistics, but they want to argue about why my analysis is wrong. Or they might believe they understand the tests I run, but their interpretations are not correct. As a sole statistician, I also have had the challenge of coming to conclusions without validation from anyone else.

The opposition I have faced over the years includes being called unqualified by individuals who admit to not knowing anything about statistics, stakeholders threatening to go to the legislature to have me fired, elected officials rejecting my expertise while admitting to questionable practices, and male stakeholders refusing to address me.

It was and still is hard to not take this opposition personally. What helped me deal with opposition the most was gaining the trust of my colleagues and boss. Having their trust in me as an expert means I have their support any time I meet opposition. When I feel like an imposter, I have the trust of the people who matter.

Reaching Out

Since there were no other statisticians locally who could answer my questions, it became vitally important for me to reach out to industry experts—people from other states who work in a similar oversight position and people who work for the international association. Their answers to my questions validated that what I was doing was correct. Gradually, I learned that even though I am the only statistician in the office, I am not truly alone because there are others who are willing to help. This does wonders for combating imposter syndrome.

During my first year in this position, I sought ways to network and find the professional support I craved as a sole statistician. I am an introvert, but I have put myself in uncomfortable situations again and again to grow my network.

I asked my employer to send me to the Women in Statistics and Data Science Conference for professional development. While I was there, the imposter monster grew as I was casually asked whether I have a master's or PhD and what I code in. The feeling of not belonging never felt stronger. However, that monster stoked the ember that had been flickering faintly, which quickly became a blazing fire. That was the encouragement I needed to finally earn my degree.

Achieving Success

The following month, I learned through an ASA group email that applications were being accepted for a global program in survey methodology and data science that was designed for working professionals with a background in statistics. I was accepted into the International Program in Survey and Data Science through the University of Mannheim and will soon be completing exams and writing my thesis! In a nonlinear fashion, I will finally have the master's degree I set out to earn 11 years ago (with more than 50 graduate credits from three universities). In this fully online program, I have been able to excel in the academic setting that suites me best.

Hard work, perseverance, sticking to my guns, getting answers from the right people, believing what is objective and true, having the right people in my corner, putting myself in uncomfortable situations to allow myself to grow: This is how I combat imposter syndrome.

I cannot ignore the cheerleading from my husband. Even though he does not fully understand the intimate details of what I do, he recognizes the value I bring to my team. When I feel like an imposter, he points out the ways my team has benefited by my expertise—whether it is drafting responses for legislators so they understand our analysis, explaining a statistical concept to teammates, or implementing new technology that makes our process more efficient.

So now, as I look out the window of my 10th floor office with my name on the door, I know I am not an imposter. I overcame adversity. I conquered learning challenges and am succeeding in my studies. I lead the industry in my state and educate elected officials on statistical practices. I know I am an expert in my field. ∎

Contributing Ambassadors

Carlos A. Diaz-Tufinio
Mexico (2019)

Vikash R. Satyal
Nepal (2019)

Seksan Kiatsupaibul
Thailand (2018)

Saleha N. Habibullah
Pakistan (2018)

Adedayo Adepoju
Nigeria (2016)

Mohammad Shafiqur Rahman
Bangladesh (2015)

Juan Carlos Salzar Uribe
Colombia (2014)

Eiliana Montero
Costa Rica (2010)

Statisticians Tell of **COVID-19 Effects** Around the World

Amarjot Kaur, Carolina Franco, Christopher McMahan, Mark Otto, Alexandra M. Schmidt, and Hamasaki Toshimitsu

The COVID-19 pandemic has caused disruptions around the world, including within the statistical community. To understand the unique effects the pandemic has had on the academic, professional, and personal lives of statisticians in various countries, we interviewed several recent ASA Educational Ambassadors (EAs) from Mexico, Nepal, Thailand, Pakistan, Nigeria, Bangladesh, Costa Rica, and Colombia. Educational Ambassadors are scholars selected yearly based on a competitive application process administered by the ASA Committee on International Relations in Statistics.

All EAs were asked the same set of questions, and the responses were consolidated and slightly edited—with their permission—for length.

Academic Work, Collaboration, and Funding

There were diverse experiences while everyone quickly adapted to new ways of teaching, working, and collaborating due to the pandemic. Teaching became virtual nearly everywhere and had its pros and cons. Many experienced enhanced collaborations due to virtual outreach, while others experienced the opposite due to a hiatus in research projects and funding.

CARLOS A. DIAZ-TUFINIO | MEXICO
"As around the world, the forced social distancing has been a breaking point in all

activities. My institution was efficient and quick to respond partly because of learnings from the prior earthquake in Mexico City. Collaborations were enhanced using virtual tools, and so did the participation in international meetings."

JUAN CARLOS SALZAR | COLOMBIA
"Although virtual classes were carried out regularly and without interruption, they represented significant challenges, especially for students who did not have the resources and a good internet connection. Not being able to go regularly to my work office caused limitations in consulting books and papers. Collaboration increased with an increase in COVID-19-related research and demand for data analysis."

ADEDAYO ADEPOJU | NIGERIA
"Nigeria was hit hard by the COVID-19 pandemic, and it was even worse for the lecturers in the public universities across the nation, as the Academic Staff Union of Universities had embarked on an industrial strike shortly before the lockdown. My research projects and funding were adversely impacted, but I was able to participate in several virtual conferences, meetings, and seminars."

MOHAMMAD SHAFIQUR RAHMAN | BANGLADESH "We have been taking classes online since and doing all meetings online; however, I have to go to the office twice a week. The funding reduced somewhat, but the collaboration increased."

SEKSAN KIATSUPAIBUL | THAILAND
"My academic activities have moved to online platforms that have both pros and cons. Thai statisticians are mostly users of statistical methods. We did not observe significant changes in methodological research funding."

VIKASH R. SATYAL | NEPAL "The pandemic significantly changed my daily routine with all classes going virtual. It was a new experience for me as, in Nepal, we had no virtual class before the pandemic. We visited our institutes for attendance once a day. Academic funding was weak in the past and no big impact was seen, though funding granted for training in Basic R and a conference got canceled."

EILIANA MONTERO | COSTA RICA "The lockdown may be inconvenient for me and my colleagues, but, for many others in this country, it's a matter of life or death—not only health wise but also economic wise. I teach all my classes virtually. Many students are missing classes due to difficulties related to internet access. Teaching virtually poses special challenges to track students' engagement and evaluation."

SALEHA HABIBULLAH | PAKISTAN
"The lockdown brought with it a huge change in our daily routines in that we were working from our *homes,* teaching our students *online* for the first time in our lives. For me, the forum that provided opportunities for collaborations with national and international colleagues was the PISTAR Online Workshop Series (*https://pistar.org*), initiated by me on June 27, 2020."

Global Communities
People's lives throughout the world were affected due to public health measures instituted to contain the spread of the virus. Although health measures helped control the spread of the virus, they resulted in other effects.

JUAN CARLOS SALZAR | COLOMBIA
"During the first COVID-19 wave, Colombia was in lockdown for 165 days, which greatly affected small businesses and left many bankrupt. This resulted in an increase in the rate of unemployment, which in turn led to an increase in the number of robberies."

ADEDAYO ADEPOJU | NIGERIA
"Nigeria was in lockdown for three months, and small businesses were going bankrupt, with unemployment increasing. There also was an increase in violence, including rape and domestic violence. Colleagues were frustrated by the financial hardships, resulting in many dealing with depression."

MOHAMMAD SHAFIQUR RAHMAN | BANGLADESH "In Bangladesh, people with low incomes are struggling to manage daily meals, and many lost their jobs."

VIKASH R. SATYAL | NEPAL "There were two lockdowns in Nepal lasting several weeks. The greatest impact was on the rate of unemployment. In Kathmandu, hundreds of people were supported by public charities."

SEKSAN KIATSUPAIBUL | THAILAND "Bangkok was slow in adapting online capabilities in the past, and the biggest impact of the lockdown was that we have to speed up online capabilities."

EILIANA MONTERO | COSTA RICA "Many students dropped classes because they could not afford internet access. At the community level, many citizens don't have the funds to stay home without working. At the university, we were lucky since most of us can work virtually with guaranteed salaries. The unemployment rate has rounded 25 percent, and there have been protests against the government."

SALEHA N. HABIBULLAH | PAKISTAN
"In developing countries, many people below the poverty line earn their livelihood on a daily basis. For them, things were difficult during the lockdown, and this was exactly the reason why the prime minister of Pakistan advocated smart lockdown, not complete lockdown."

CARLOS A. DIAZ-TUFINIO | MEXICO
"The quarantine has lasted over a year, and it seriously affected many businesses. Its impact has been reflected in the slowness in economic recovery and increase in robberies and insecurity."

Challenges Faced by the Statistical Community
The statistical communities experienced unprecedented and unique challenges due to the protective measures put in place to address the pandemic.

JUAN CARLOS SALZAR | COLOMBIA
"One problem was not being able to invite foreign statisticians to teach us about the latest trends in statistics, causing—in the medium term—a stalemate in the statistical discipline."
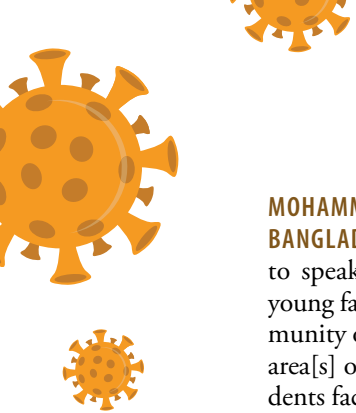
MOHAMMAD SHAFIQUR RAHMAN | BANGLADESH "We need experts to speak among the students and young faculties of the statistics community on some topics in emerging area[s] of statistics. Graduating students faced difficulties in managing admission and funding for higher studies (e.g., PhD) abroad that used to be easier for them earlier."

ADEDAYO ADEPOJU | NIGERIA "The key challenges are in the areas of training, statistical literacy, advocacy, and collaboration. The social distancing restrictions changed the way statistical activities are undertaken. It has become inevitable to utilize virtual platforms. Unfortunately, the infrastructure such as internet, power, etc., are awfully poor and, when available, very expensive."

SEKSAN KIATSUPAIBUL | THAILAND "We observed increases in graduate student enrollment, and that strains our workforce."

EILIANA MONTERO | COSTA RICA "We, as teachers, didn't know how to teach virtually. It was a very violent change. Then, we had to teach classes of 50 students! We couldn't tell at first if they were paying attention or not. We are learning now and getting training. How to administer tests is still a big problem, for security concerns and the possibility of cheating."

SALEHA N. HABIBULLAH | PAKISTAN "Faculty and students need to cope with frequent internet disconnectivity problem[s]. In order to avoid [the] use of unfair means in online examinations, students are required to keep their cameras on, but we cannot be sure that this is an effective deterrent."

CARLOS A. DIAZ-TUFINIO | MEXICO "Statisticians had [an] important role in transmitting accurate information, in educating [the] general population, and in combating *infodemics*—another pandemic that we are facing."

Lessons Learned from COVID-19

With the pandemic taking the forefront in many aspects of life, so did the role of technology and the internet in education and communications. Although technology made virtual learning more accessible, it also revealed gaps in the infrastructure across countries.

ADEDAYO ADEPOJU | NIGERIA "Nigeria is one of the countries mostly hit by this outbreak, and it is unfortunate that people were unable to connect with their loved ones, particularly those in the rural/remote areas. Therefore, internet access should be considered a human right and should be made available and affordable for everyone."

JUAN CARLOS SALZAR URIBE | COLOMBIA "An important lesson is that it is possible to do things differently and maybe more effectively using virtual platforms."

SEKSAN KIATSUPAIBUL | THAILAND "Online teaching can create unthinkable opportunities. For example, in term[s] of teaching and evaluation, I relied less on in-person exams (not allowed during the lockdown) and focused more on smaller online assignments over the period of the course. I feel that I better understand the individual development of my students."

VIKASH R. SATYAL | NEPAL "Virtual technology can reach communities that have less access to education due to distance and economical barriers. The only bottleneck is that governments should provide very cheap internet. The other advantage of being virtual is that you can offer many different choices of subjects."

MOHAMMAD SHAFIQUR RAHMAN | BANGLADESH "I realized that we need to think for others, particularly vulnerable populations such as the elderly. Our elderly people are more vulnerable here. There are limited funds from the government for them. "

CARLOS A. DIAZ-TUFINIO | MEXICO "Life and our lifestyle are such fragile things, and even though we think we are achieving a stable way of life, this might change from one second to the next one. So, for that, flexibility and adaptability are essential abilities that we, as college professors, need to reinforce in the next generations of professionals in all areas."

EILIANA MONTERO | COSTA RICA "Now some of us are more aware of the importance of showing solidarity and empathy with people who have been suffering the economic effects of the pandemic. We are also learning the opportunities of virtual education, but also its pitfalls, in a context of high inequality."

SALEHA N. HABIBULLAH | PAKISTAN "Two benefits of COVID are an increased awareness regarding hygiene for health and an increased awareness of the problems faced by people below the poverty line."

Our EAs reflected on various aspects of the pandemic and shared the impact to their statistical communities, including the vulnerability of certain populations within their countries. The role of technology and the internet in education and communications took the forefront. While the reliance in e-learning created new opportunities to unify statisticians around the world, it also created new hardships in areas where internet availability is scarce. Professional organizations, including the ASA, shifted statistical conferences to an all-virtual format, which helped break down some barriers created by the pandemic and offered a continued sense of academic community. The shift toward virtual conferences in 2020 allowed participation around the globe in a cost-effective way, which otherwise would not have been possible. Nonetheless, the in-person human connection was missed. ∎

Minnesota

■ The Department of Mathematics and Statistics at Carleton College invites applications for a tenure-track assistant professor appointment in statistics beginning September 1, 2022. Learn more about the position, the department and the application process at *http://careers.carleton.edu.* For full consideration, applicants should apply by October 1, 2021. Women and members of groups underrepresented in statistics and mathematics are strongly encouraged to apply. EOE.

Pennsylvania

■ The Department of Biostatistics in the Graduate School of Public Health at the University of Pittsburgh seeks applicants for a faculty position with primary responsibilities on education and collaborative research. The position may be at the assistant or associate professor level (appointment stream), to begin in Spring 2022 or earlier. Details of the position and application process can be found through requisition #21004277 at *join.pitt.edu.* EOE.

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.*

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NC STATE UNIVERSITY

Department of Statistics
Tenure-Track Faculty Positions

The Department of Statistics at North Carolina State University in Raleigh, North Carolina seeks to hire multiple tenured/tenure-track faculty. All ranks will be considered. The start date is August 2022.

Applicants with interests and expertise in theoretical or methodological research in any area of statistics or biostatistics will be considered. Candidates with interests in data science, machine learning, and modern methods of data analysis more generally are encouraged to apply. The ability and desire to supervise graduate student research and to pursue excellence in teaching are essential.

To apply, please visit: *https://jobs.ncsu.edu/postings/146782*

The Department provides a dynamic environment for teaching, research and collaborations across disciplines. Inclusiveness and diversity are academic imperatives and are university goals: You will be expected to foster an environment that is supportive and welcoming of all groups. We are interested in candidates who have experience working with students from diverse backgrounds and have a demonstrated commitment to improving access to higher education for students from underrepresented groups.

The Department's location in the Research Triangle provides rich opportunities for interactions with industry; other universities, including Duke University and the University of North Carolina at Chapel Hill; and government agencies. Faculty enjoy collaborations with medical researchers at Duke, environmental scientists at the EPA research facility, pharmaceutical researchers at Glaxo-SmithKline, and software developers at SAS Institute, among many others.

All applicants must have a Ph.D. in Statistics or Biostatistics or a related field by the time of employment. Review of applications will begin soon and will continue until the positions are filled. Questions about the search may be directed to the Search Committee Chair: *stat_search@stat.ncsu.edu*.

NC State University is an equal opportunity and affirmative action employer. Women and members of other underrepresented groups are encouraged to apply. In addition, NC State University welcomes all persons without regard to sexual orientation or genetic information.

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What was your first job, and how did it prepare you for a career in statistics?

For next month, we ask you to share a photo of what a statistician's desk looks like.

Melissa Jay • @MelissaJay
In high school I was a rock climbing instructor. Looking back, it gave me experience with explaining new concepts (tying knots, belaying, setting up anchors) in different ways to different audiences. Definitely a skill that translates well to statistical collaborations!

Caleb King • @ckingstats
My first job was an "exception manager" correcting and processing applications at a life insurance company. No statistics per se, but definitely a lot of data cleaning!

Steve Wang • @SteveWang251
My first job, in high school, was being a dishwasher in a restaurant. It didn't really prepare me for a career in statistics, other than emphasizing that I should stay in school so I could get a better job.

Catey Bunce • @CateyBunce
CID secretary at police station. Showed me how important honesty is. Best statisticians are honest ones although clearly we all make mistakes at times.

Melissa Cidade • @cidade_melissa
First job was a lifeguard in high school and college. Taught me to trust my training and keep my head in a crisis - both helpful in my current career!!

Amy • @amyhherring
Fraud analyst in a credit card center, which didn't involve data analysis but did convince me I wanted a job with more personal agency!
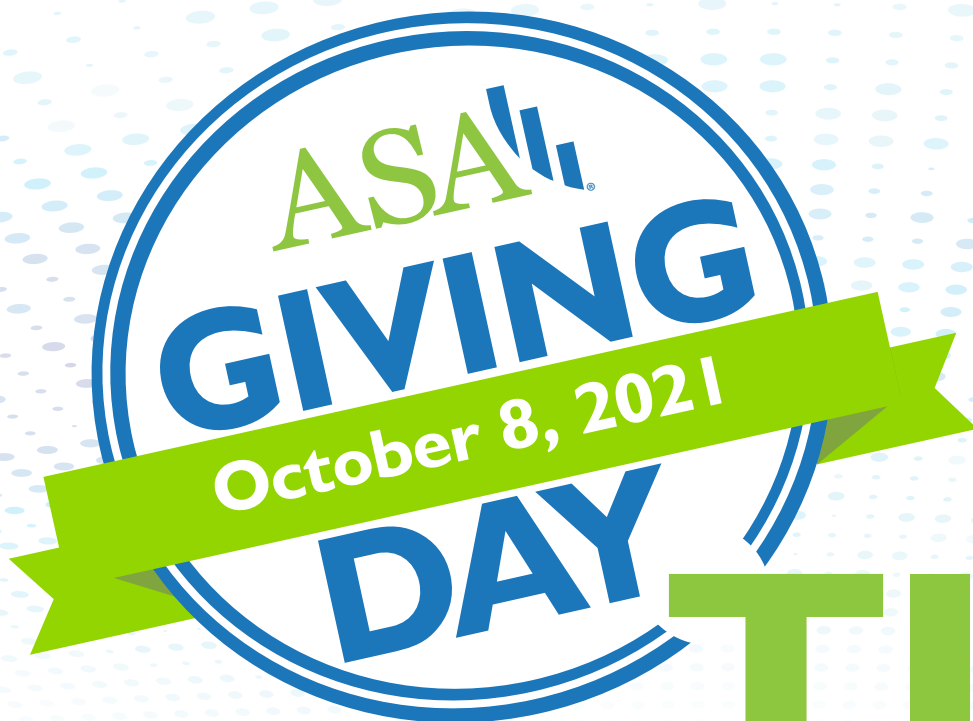
Robert D McCreary • @ RobertMcCrear20
Well, my first job was as "manager" of a departmental piano lab, where I mostly transcribed sheet music with odd time signatures. As for the bridge to a career in statistics, I suppose this experience forced me to stop counting with my fingers (which turns out, is impractical).

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October 8, 2021

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Richard D. De Veaux — C. Carlisle and Margaret Tippit Professor of Statistics, Williams College

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