

Statistical Theory and Practice

Nancy Reid
University of Toronto

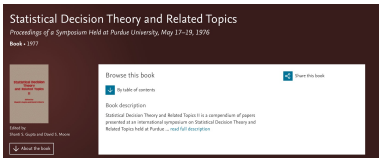
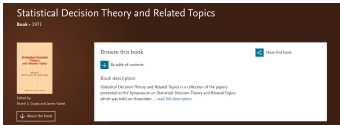
June 8 2023



10th International Purdue Symposium on Statistics

Demystifying Data Science via Statistics: Theory and Applications

JUNE 6TH - 9TH, 2023



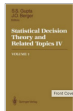
Statistical Decision Theory and Related Topics III, Volume 1



Shanti Swarup Gupta, James O. Berger
Academic Press, 1982 - [Statistical decision](#) - 526 pages

★★★★★
0 Reviews

Statistical Decision Theory and Related Topics IV: Volume 1



Shanti S. Gupta
Springer New York, 1988 - [Mathematics](#) - 418 pages

★★★★★
0 Reviews

The Fourth Purdue Symposium on Statistical Decision Theory and Related Topics was held at Purdue University dur period June 15-20, 1986. The symposium brought together many prominent leaders and younger researchers in stat decision theory and related areas. The 65 invited papers and discussions presented at the symposium are collected two-volume work. The papers are grouped into a total of seven parts. Volume I has three parts: Part 1 -Conditioning

[More »](#)



Sixth Purdue International Symposium on Statistics

The Sixth Purdue International Symposium on Statistics was held on June 17-23, 1998, at Purdue University in West Lafayette, Indiana, USA. The co-chairs were Shanti S. Gupta and Mary Ellen Bock.

The symposium began with simultaneous workshops "Interfaces Between Major Statistical Paradigms" and "Nutrition and Statistics" on June 17-19. The

conference "Statistical Decision Theory and Related Topics" was held June 19-21 and included invited and contributed paper sessions. The workshop "Statistical Genetics: An Interdisciplinary Future" was held on June 21-23 consisting of invited and contributed talks as well as poster sessions.

See "Sixth Purdue International Symposium on Statistics", page 4

Seventh Purdue International Symposium on Statistics Information and Call for Papers for The Components of the Symposium

WEST LAFAYETTE, INDIANA

16-24 JUNE 2001

Topic(s)

[For Symposium Materials Download \(24 June\)](#)

[Workshop A](#)

[Biostatistics and Microarrays \(24-25 June\)](#)

[Conference](#)

[Statistical Decision Theory and Related Topics \(17-24 June\)](#)

[Workshop B](#)

[Multiple Connections and Metrics Models for Large Data Sets \(23 June\)](#)

[Workshop C](#)

[Statistical Computation \(23-24 June\)](#)

8th International Purdue Symposium on Statistics

Generally, in the Statistical Sciences for the 21st Century

[Program Committee](#)

The International Purdue Symposium on Statistics is a venerable tradition, an event that has spanned more than a century of Purdue since the late 1890s. Initiated by Professor Stuart Shapiro, it is an effort to further the development of the field of Statistics. The theme of the 8th Purdue Symposium on Statistics is "Statistics in the 21st Century".

[Sponsors](#)

The Purdue Symposium will be made up of four days of [Workshops](#), [Workshops](#), June 20-23, and a half day of [Statistical Decision Theory and Related Topics](#), June 24-25, 2001, and a variety of social activities. This year, we are joining the Symposium under the theme of statistics in a variety of forms. We recognize that the statistical sciences form an interdisciplinary domain, with links ranging from molecular, applied mathematics to the most advanced statistics, probability and stochastic models, and new disciplines drawing on other disciplines such as computer science for modeling, learning, or data science for environmental statistics, modeling towards our new century.

We are committed to the discipline of statistics as a vehicle for fostering the participation of underrepresented groups in the sciences. Chemistry can also be Statistics! In the practice of statistics, from research, to consulting, to teaching, at Purdue Statistics, we are committed to our efforts to maintain and increase diversity in all its forms within our department and in the profession.

9th International Purdue Symposium on Statistics and Celebration of the 50th Anniversary of the Department of Statistics

DATA REVOLUTION: OPPORTUNITIES AND CHALLENGES FOR STATISTICS

The International Purdue Symposium on Statistics is a venerable tradition, an event that has been held every five years at Purdue since the late 1900s (started by Professor Stuart Shapiro). In an effort to further the development of the field of Statistics, the theme of the 9th International Purdue Symposium on Statistics was "Data Revolution: Opportunities and Challenges for Statistics".

The 2001 Purdue Symposium included one day of workshops on June 5, three days of sessions and plenary talks, June 6-8, and a variety of social activities.

You can download the [full symposium program as a PDF](#).

[Program PDF](#)

[Workshops](#)

[Plenary](#)

[Travel Information](#)

- Common themes:
 - design of experiments
 - selective inference
 - probability
 - remarkable list of speakers
- Theoretical frameworks
 - statistical decision theory
 - Bayesian inference
 - asymptotic theory
- increasing emphasis on applications, increasing breadth

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- **2023**
 - probability
 - variable selection
 - high-dimensional time series
 - dimension reduction
 - multiple testing
 - federated learning
 - data integration
 - deep learning
 - spatial statistics
 - foundations
 - Bayesian nonparametrics
 - actuarial science and risk
 - ...
 - mobile health
 - neuroscience
 - 'omics
 - Covid
 - privacy
 - biomedicine
 - ...

Applications: a haphazard walk

Nudging A meta-analysis in behavioural science Mertens et al., PNAS 2021

BWAS Brain-wide association studies Marek et al., Nature 2021

Drought Climate change attribution World Weather Attribution report, April 2023

Women Co-authorship and gender Ross et al., Nature 2022

Cash Effect of policy on mortality Richterman et al., Nature 2023

Neuro Risk of Parkinson disease Goldman et al., JAMA 2023

Faces Human perception Wardle et al., PNAS 2021

Purdue Symposium June 8 2023 **Chocolate** The story that never dies

Globe & Mail, June 5

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many small effects, publication bias, Bayes/freq

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logistic regression, retrospective cohort study

Faces Human perception

sign test, regression, computational modelling

Some common features

- data collection is complex, generally well-described, likely very impactful
 - e.g. **Cash**: mortality data and cash transfers for 37 countries over 20 years
 - e.g. **Women**: “the analytical linked dataset ... is constructed from three sources”

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- increasing emphasis on effect estimates and standard errors easier in some fields
 - e.g. **Drought, Cash, Nudging, Women**

- Statistics needs a healthy interplay between theory and applications
 - theory meaning **foundations**, rather than theoretical analysis of specific techniques
- Foundations? — “A solid base, on which rests a large structure”

OED

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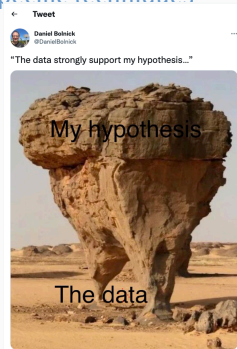


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@DanielBolnick


“The data strongly support my hypothesis”

What are the foundations of statistics?


Google foundations of statistics

About 320,000,000 results (0.53 seconds)


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Amazon CA




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\$90.50
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The 'foundations of statistics concerns the epistemological debate in statistics over how one should conduct inductive inference from data.

 Wikipedia
https://en.wikipedia.org/wiki/Foundations_of_statistics

Google foundations of statistics


What are the basic foundations of statistics?

What are the 4 fundamental elements of statistics?

What are fundamentals of statistics?

What are the 5 types of statistics?


Feedback

 Amazon.ca
<https://www.amazon.ca/Foundation-Statistics-Leona...>

The Foundations of Statistics: Savage, Leonard J.


An important foundation of statistics ... Classic analysis of the subject and the development of personal probability; one of the greatest controversies in modern ...

★★★★★ Rating: 4.6 · 101 reviews · \$20.70 · In stock

 ScienceDirect
<https://www.sciencedirect.com/topics/mathematics/f...>

Foundations of Statistics - an overview


The foundations of statistics have changed and evolved with time. The early use of probability for statistical analysis was closely tied to the development of ...

 Goodreads
<https://www.goodreads.com/book/show/163905...>

The Foundations of Statistics by Leonard J. Savage

Foundations of Statistics is a book that discusses concepts about statistics. Inductive Inference & Axiomatic Concept of Probability are some of the early ...

★★★★★ Rating: 3.9 · 7 reviews · US\$9.99

 edX
<https://www.edx.org/course/fundamentals-of-statist...>

Fundamentals of Statistics

Fundamentals of Statistics ... Develop a deep understanding of the principles that underpin



Statistics, Foundations

D. A. S. Fraser

University of Toronto

- I. Background
- II. Overview
- III. Probability Model
- IV. Statistical Model
- V. Statistical Theory
- VI. Foundations
- VII. Principles
- VIII. Likelihood Asymptotics



By the mid 1950s there were substantial criticisms of the decision theory approach; in particular, there had been a major failure of the theory to produce reasonable statistical procedures for a broad range of problems.

In the mid-1950s publications by Fisher (1956) and Savage (1954) substantially altered the directions of statistics and opened wide areas for development. Fisher proposed insightful methods based on the earlier view of examining the model data combination $(\mathcal{D}, \mathcal{M})$. Savage favored the Bayesian approach emphasizing the use of personal priors to represent the latent views of the investigator concerning possible values for the parameters.

Both these directions opened new opportunities to a discipline that had become partially paralyzed by the decision-theoretic approach and by its inability to produce answers for wide-ranging problems.

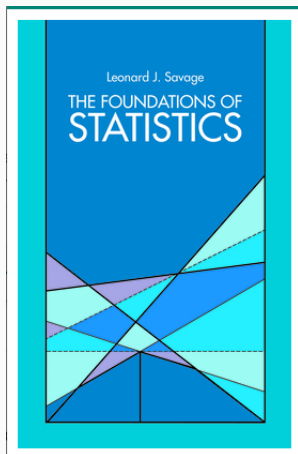
VI. FOUNDATIONS

The foundations of statistics have changed and evolved with time. The early use of probability for statistical analysis was closely tied to the development of the least squares method, a widely used technique dating from Laplace and earlier. The Bayesian approach also comes from this same earlier period. Neither could be viewed at that time as an all-embracing foundation for statistics.

The decision theory approach, however, did present it-

By the mid 1950s there were substantial criticisms of the decision theory approach; in particular there had been a major failure of the theory to produce reasonable statistical procedures for a broad range of problems

... publications by Fisher (1956) and Savage (1954) substantially altered the directions of statistics and opened new opportunities to a discipline that had become partially paralyzed ...



It is unanimously agreed that statistics depends somehow on probability. But, as to what probability is and how it is connected with statistics, there has seldom been such complete disagreement and breakdown of communication since the Tower of Babel. Doubtless, much of the disagreement is merely terminological and would disappear under sufficiently sharp analysis.

[Link](#)

... What are the foundations of statistics?

- probability, analysis, applied mathematics

modelling

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modelling

- Bayes, Neyman, Fisher

approaches to inference

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- role of sufficiency, ancillarity, conditioning, asymptotic theory
- sparsity, causality, assumption-free/lean inference, stability, prediction, decisions

Linking theory with practice

Nudging A meta-analysis in behavioural science

many small effects, publication bias, Bayes/freq

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Purdue Symposium on Ethics 8/2022
Chocolate The story that never dies

Statistics in the news

Economist, July 29



Menu

Weekly edition

Search

Science & technology | Nudge factor

Evidence for behavioural interventions looks increasingly shaky

The academic literature is plagued by publication bias

“plagued by publication bias”





RESEARCH ARTICLE | PSYCHOLOGICAL AND COGNITIVE SCIENCES | 



The effectiveness of nudging: A meta-analysis of choice architecture interventions across behavioral domains

[Stephanie Mertens](#)  , [Mario Herberz](#) , [Ulf J. J. Hahnel](#) , and [Tobias Brosch](#)   [Authors Info & Affiliations](#)

Edited by Susan Fiske, Psychology Department, Princeton University, Princeton, NJ; received April 27, 2021; accepted November 24, 2021

December 30, 2021 | 119 (1) e2107346118 | <https://doi.org/10.1073/pnas.2107346118>

THIS ARTICLE HAS BEEN UPDATED

The response

LETTER | JULY 19, 2022 | 

No reason to expect large and consistent effects of nudge interventions

Barnabas Szaszi, Anthony Higney, [...] Elizabeth Tipton



[VIEW THE ORIGINAL ARTICLE:](#)

The effectiveness of nudging: A meta-analysis of choice architecture interventions across behavioral domains

[THIS ARTICLE HAS A REPLY:](#)

Reply to Maier et al., Szaszi et al., and Bakdash and Marusich: The present and future of choice architecture research

LETTER | JULY 19, 2022 | 

Left-truncated effects and overestimated meta-analytic means

Jonathan Z. Bakdash and Laura R. Marusich



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LETTER | JULY 19, 2022 | 

No evidence for nudging after adjusting for publication bias

Maximilian Maier, František Bartoš, [...] Eric-Jan Wagenmakers



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REPLY | JULY 19, 2022 | 

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Stephanie Mertens, Mario Herberz, [...] Tobias Brosch



[THIS ARTICLE REPLIES TO:](#)

No evidence for nudging after adjusting for publication bias

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No reason to expect large and consistent effects of nudge interventions

In fairness

Mertens et al. 2021



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The effectiveness of nudging: A meta-a...

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The effectiveness of nudging: A meta-analysis of choice architecture interventions across behavioral domains

Contributors: [Stephanie Mertens](#), [Mario Herberz](#), [Ulf J.J. Hahnel](#), [Tobias Brosch](#)

Date created: 2020-09-01 05:46 PM | Last Updated: 2021-12-15 06:52 PM

Identifier: DOI 10.17605/OSF.IO/FYWAE

Category: Project

Description: *This project is funded by the Swiss National Science Foundation and the Swiss Federal Office of Energy. It investigates the effectiveness of choice architecture interventions across behavioral domains.*

Files



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Components

Some details

“Materials and methods”

Mertens et al. 2021

- 440 estimates of effect size: $(\text{treatment} - \text{control mean}) / (\text{estimated std error})$
- 212 unique publications; sometimes several tmts with the same control
- Random effects to accommodate this
- Additional fixed effects (moderators) for secondary analysis —
types of interventions; behavioural domain; study characteristics
- Publication bias assessed by plotting standard error vs effect size

Egger's test

Some results

Martens et al. 2021

Figure 2

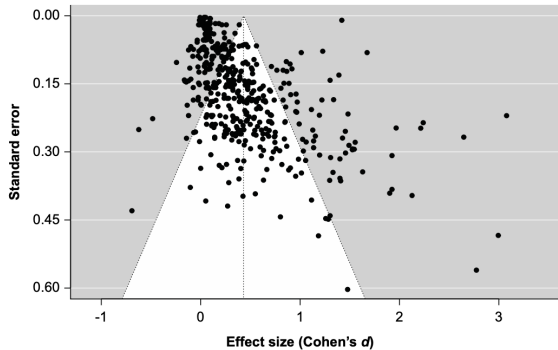
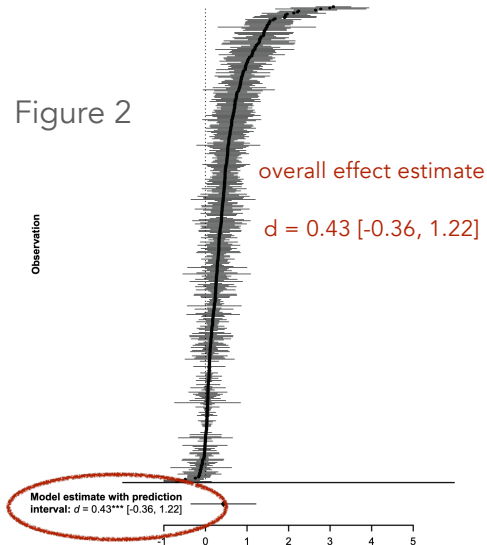


Fig. 3. Funnel plot displaying each observation as a function of its effect size and SE. In the absence of publication bias, observations should scatter

Standard error increases with effect size

The letters

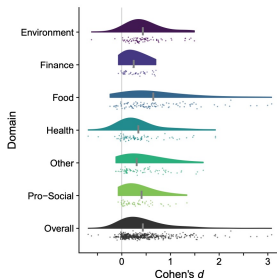
1. Maier et al. — publication bias not correctly taken into consideration

"A newly-proposed bias-correction technique — robust Bayesian meta-analysis avoids an 'all-or-none' debate over whether or not publication bias is 'severe' "

2. Szaszi et al. — the average effect size is not very informative, given the variation between studies

"Even after adjusting for publication bias, the effects ... vary considerably

3. Bakdash & Maurisch — estimated effects in studies are right-skewed

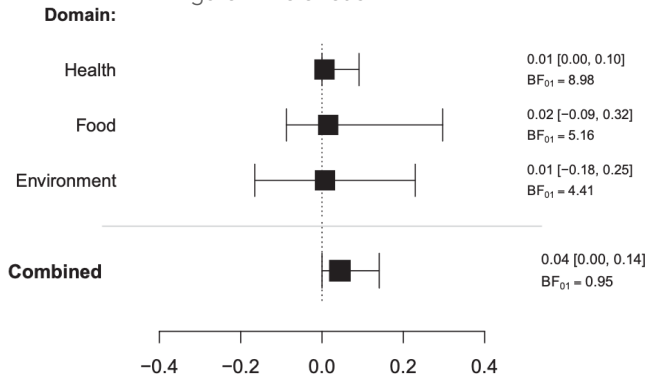


Foundations

1. Maier et al. — publication bias not correctly taken into consideration

"A newly-proposed bias-correction technique — robust Bayesian meta-analysis avoids an 'all-or-none' debate over whether or not publication bias is 'severe' "

Figure 1 Meier et al.



Model-averaged mean effect size estimates with posterior credibility intervals and Bayes factors

Szaszi et al applied various non-Bayesian adjustments for bias with similar results



NEWS

Science

Deadly African drought not possible without climate change, study finds



Warming climate made long rains twice as likely to underdeliver, World Weather Attribution calculates

Thomson Reuters · Posted: Apr 27, 2023 8:43 AM EDT | Last Updated: April 27



ALJAZEERA

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News | Drought

Global warming made Horn of Africa drought possible: WWA study

World Weather Attribution scientists say rising greenhouse gas emissions made the nearly 3-year drought at least 100 times more likely.

Purdue Symposium June 8 2023

Climate Change Made East Africa's Drought 100 Times as Likely, Study Says

The findings starkly show the misery that the burning of fossil fuels, mostly by rich countries, inflicts on societies that emit almost nothing by comparison.



A water well near the town of Kelafo in Ethiopia, one of the nations hit hardest by the drought. Eduardo Soteras/Agence France-Presse — Getty Images

Human-induced climate change increased drought severity in Horn of Africa

[Link](#)

1. Joyce Kimutai, *Kenya Meteorological Department, Nairobi, Kenya*
2. Clair Barnes, *Grantham Institute, Imperial College London, UK*
3. Mariam Zachariah, *Grantham Institute, Imperial College, London, UK*
4. Sjoukje Philip, *Royal Netherlands Meteorological Institute (KNMI), De Bilt, The Netherlands*
5. Sarah Kew, *Royal Netherlands Meteorological Institute (KNMI), De Bilt, The Netherlands*
6. Izidine Pinto, *Royal Netherlands Meteorological Institute (KNMI), De Bilt, The Netherlands*
7. Piotr Wolski, *Climate System Analysis Group, University of Cape Town, Cape Town, South Africa*
8. Gerbrand Koren, *Copernicus Institute of Sustainable Development, Utrecht University, Utrecht, the Netherlands*
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10. Wenchang Yang, *Department of Geosciences, Princeton University, Princeton, NJ 08544, USA*

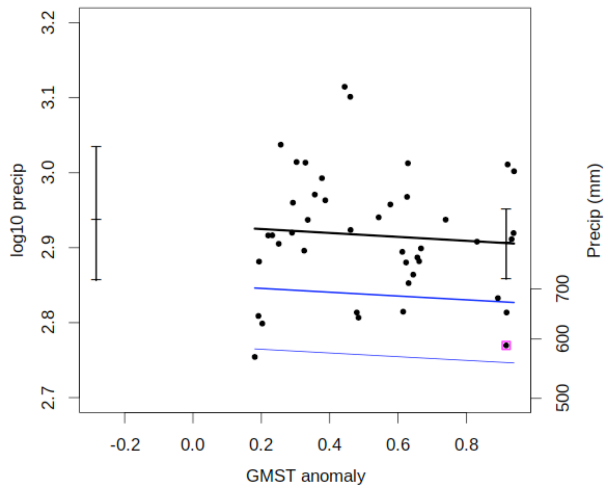
- observational data, 3 sources
 1. global daily rainfall & temperature
 2. daily rainfall
 3. monthly rainfall
 - 4-year smoothed mean surface temperature
- $0.5^\circ \times 0.5^\circ$, 1979 –
infra-red, “SoA”, 1981 –
1981–2014
- proxy** for anthropogenic climate change

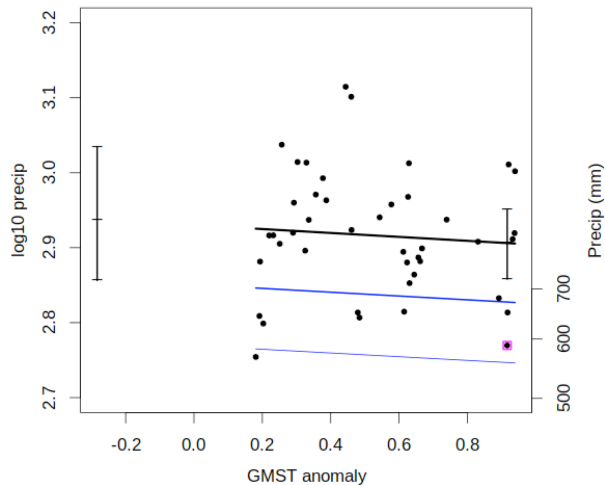
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 2. daily rainfall infra-red, “SoA”, 1981 –
 3. monthly rainfall 1981–2014
- 4-year smoothed mean surface temperature **proxy** for anthropogenic climate change
- climate modelling data, 4 sources
 1. combine 12 global and 8 climate models: resolution 0.44° 29 sims
 2. combine 5 global and 4 climate models: resolution 0.22° 10 sims
 3. atmosphere-ocean coupled GCMs (two) 10/3 simulations
 4. sea-surface temperature forced ensemble, high resolution 11 simulations

- response is $\log_{10}(\text{monthly rainfall})$ in 2021 and 2022
and $\log_{10}(\text{PET})$ — potential evapotranspiration
- covariates are global temperature anomaly, and ENSO index
El Nino-Southern Oscillation
- “As a measure of anthropogenic climate change we use smoothed GMST”
Global Mean Surface Temperature
- “Methods for observational and model analysis ... and synthesis are used according to the World Weather Attribution Protocol”
Philip et al. 2020
 1. trend using observational data
 2. find climate models consistent with 1.
 3. compare predictions from 1. and 2.
 4. synthesize results in 3. to provide conclusions

- rainfall decreasing with increasing temperature

but not much

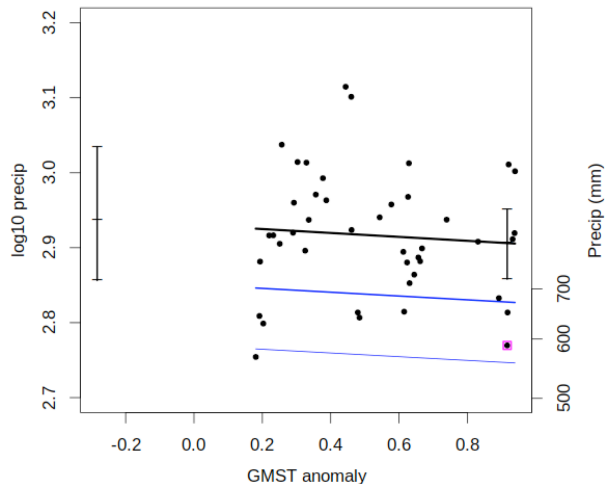




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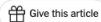
- 2022 rainfall is about a 1 in 20 year event



- rainfall decreasing with increasing temperature
but not much
- 2022 rainfall is about a 1 in 20 year event
- 2022 drought about **2 times** more likely under climate change
- uncertainty 0.1 to 360

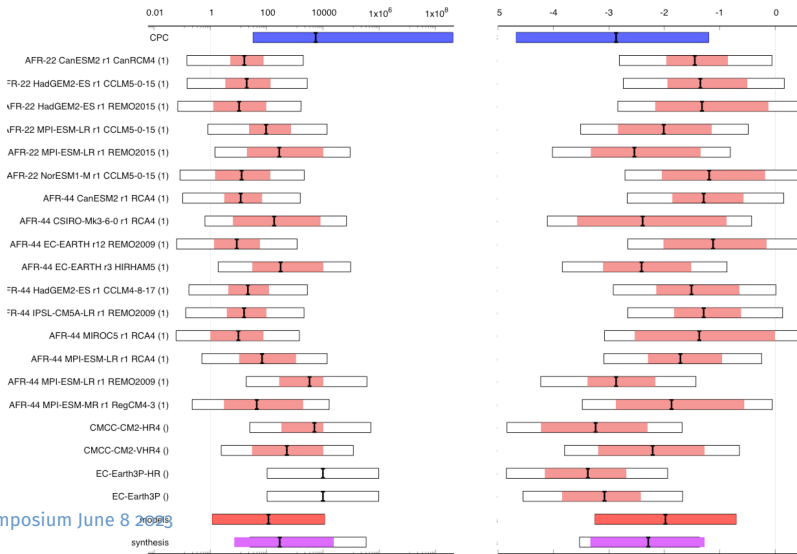
Climate Change Made East Africa's Drought 100 Times as Likely, Study Says

The findings starkly show the misery that the burning of fossil fuels, mostly by rich countries, inflicts on societies that emit almost nothing by comparison.



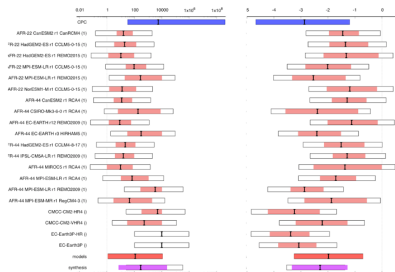
- **change the response to SPEI**
rainfall adjusted for evaporation
- consider 'long rains' and 'short rains' separately MAM, OND
- combine model simulation results with observational data
- **the first** is most important;
2022 drought now **5500** times more likely
uncertainty 32 to 4×10^8

(a) Probability Ratio (left) and Intensity change (right) for current vs. 1.2degC cooler climates

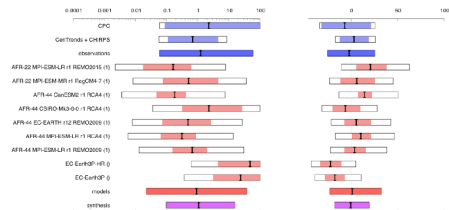


precipitation
adjusted for PET

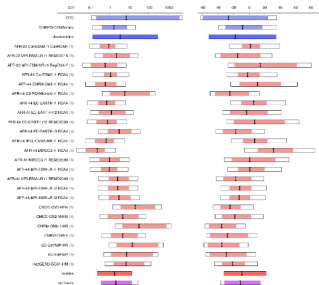
(a) Probability Ratio (left) and Intensity change (right) for current vs. 1.2degC cooler climates



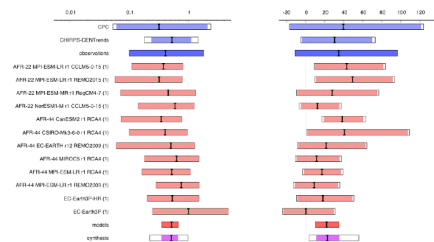
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(a) Probability Ratio (left) and Intensity change (right) for current vs. 1.2degC cooler climates

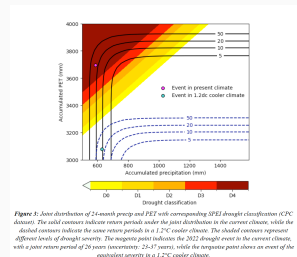


(a) Probability Ratio (left) and Intensity change (right) for current vs. 1.2degC cooler climates



The theory

- extrapolation beyond observations
extreme value modelling
- assigning uncertainty to combined results
components of variance
weighted average?
- ratios of **estimated** probabilities
unbounded confidence intervals
Behrens-Fisher
- joint modelling of precipitation and evapotranspiration
copula modelling



nature

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Women are credited less in science than men

[Matthew B. Ross](#), [Britta M. Glennon](#), [Raviv Murciano-Goroff](#), [Enrico G. Berkes](#), [Bruce A. Weinberg](#) & [Julia I. Lane](#) 

[Nature](#) **608**, 135–145 (2022) | [Cite this article](#)

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Abstract

- “finding ‘what isn’t there’ from ‘what is there’ is a fundamental problem in statistics”
- analytic data
 - 118 campuses send deidentified data to U Michigan
 - + survey + qualitative analysis
 - tracks spending on personnel for each research project
 - payroll, all funding sources
 - 57 campuses with complete data 2013–2016
 - identify **teams**: PI, faculty, PDF, PhD, UGrad, Research Staff
 - weighting of 1 for each person
 - identify **publications**
 - Web of Science
 - identify **gender**, job titles, scientific fields, patents, ...
- 9800 teams with 129,000 team members
- 39,000 articles; 18m ‘potential authorships’, 367,000 actual authorships
 - scientific articles

- **response** attribution rate = $\frac{\# \text{ actual authorships}}{\# \text{ potential authorships}} = \text{pr}(\text{attribution})$
- **covariates** date of publication, number of days worked in the team, calendar time, position in the team, team's PI
- **model**

$$P(\text{named}) = \beta_0 + \beta_1 \text{woman} + \beta^T \text{covariates} + \text{error}$$

Empirical strategy

The empirical approach was to estimate linear regressions using a model of the form

$$P[\text{named}_{i,t,e,l} | \dots] = \beta_0 + \beta_1 \text{woman}_{i,e} + X_{i,e} + M_{i,t} + O_{i,e} + \text{Team}_{i,l} + \mu_{i,t,e,l} \quad (1)$$

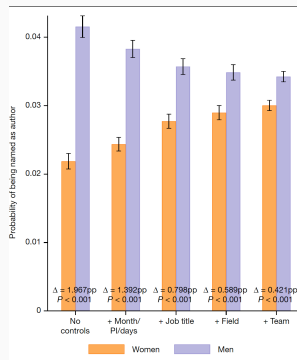
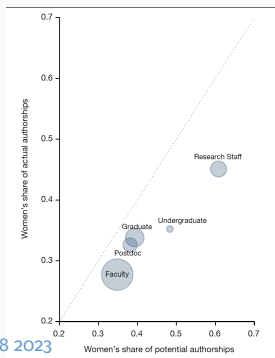
overall attribution rate **3.1%**;

attribution rate for men **4.23%**; attribution rate for women **2.12%**

includes patents

difference smaller when covariates included

but still statistically significant



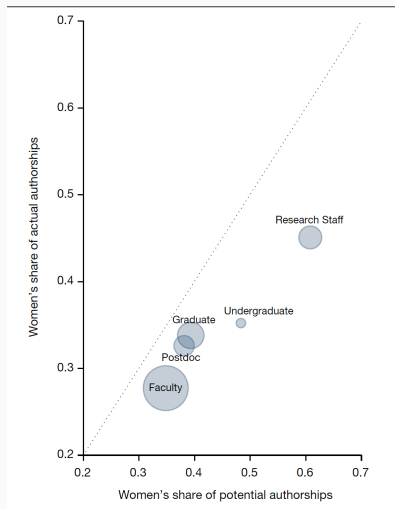


Figure 1

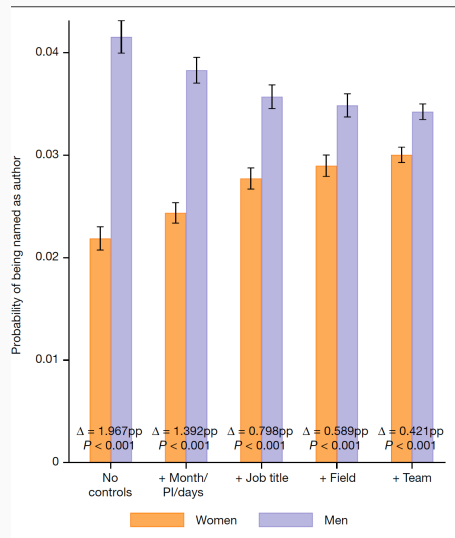


Figure 2

- linear regression but the response is a proportion
- logistic function is pretty linear for $p \in (0.2, 0.8)$
- but these p 's $\in (0.01, 0.04)$

also many t -tests comparing p s

- there's a paper for that!

On the linear in probability model for binary data

Battey, Cox & Jackson 2019

least squares estimate is more robust, coefficient directly interpretable

less efficient, incorrect for observations out of range

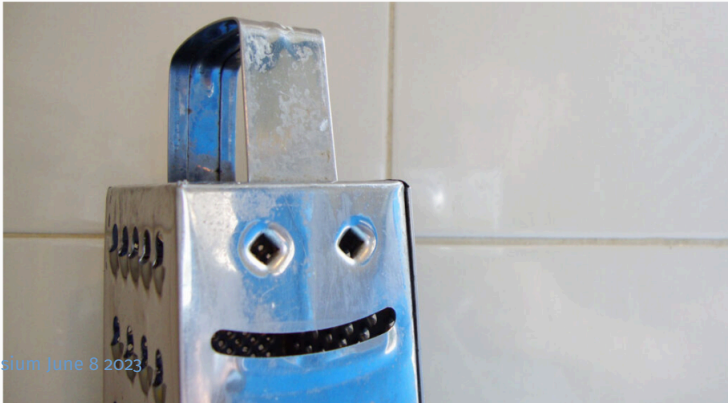
- possibly more concerning: what is the unit of observation?
potential authorship? article? team?
are the standard errors correct?

NEWS

NEUROSCIENCE

Americans tend to assume imaginary faces are male

Why people perceive faces in inanimate objects as male by default is still unclear



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RESEARCH ARTICLE



Illusory faces are more likely to be perceived as male than female

Susan G. Wardle, Sanika Paranjape, Jessica Taubert, and Chris I. Baker

+ See all authors and affiliations

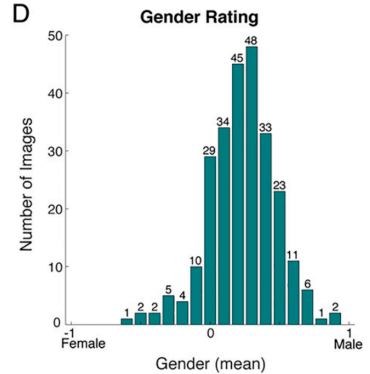
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OPINION

Will AI really change everything? Not likely

Although tools like ChatGPT can astonish us with their output, they are not operating anywhere near human intelligence

JOSEPH WILSON

OPINION

PhD candidate in linguistic anthropology at the University of Toronto

Do you have AI fatigue yet? Not a day goes by without breathless commentary on the increasing power of artificial-intelligence models. A deluge of new apps and services promises to disrupt everything from reading to law to education. “The future is here,” we are told. “Are you ready?”

blindly optimistic, claiming that AI will magically solve everything from climate change to the opioid crisis, or they are darkly dystopian, warning us that AI could escape its silicon chains and destroy humanity.

Even when AI developers themselves “warn” people of the existential threats AI could pose, as they did in an open letter recently calling for a pause in development, it functions as a marketing campaign. The tech companies are essentially congratulating each other for creating something too good. Google’s chief executive, Sundar Pichai, has called AI, without irony, a technology “more profound than fire or electricity.”

The public doesn’t know what to believe and they’re worried. A newly released poll conducted by Innovative Research Group for the 2023 Provocation Ideas Festival shows that 47 per cent of Canadians are more concerned than excited about the increased

“future-proof your career” or “become AI literate.”

The reality is that most of what we read about AI is hype. In the near term, this new crop of AI tools will probably give us slightly better-written spam in our inboxes and reams of crappy, machine-generated websites. Real, life-saving applications are indeed possible in fields such as health care and agriculture, but they’ll be hard to spot amid all the junk. Although tools such as ChatGPT and Midjourney are fun to play with and can astonish us with their output, they are not operating anywhere near human intelligence. They are essentially performing a clever parlour trick.

The reason we are astonished by their output is because, as a species, we’re gullible. We tend to read human characteristics into any pattern that even mildly resembles a human. We see faces in electrical sockets and spot human silhouettes in evening shadows. We feel bad for a discarded

heightened empathy is one of the ways technology companies have captured the public’s attention in recent months. OpenAI launched ChatGPT (which generates text) and DALL-E (which generates images) online and for free so the public could play around with them. It let the public work itself into a frenzy as they identified characteristics in the programs that were previously thought to be exclusively human: reason, humour, emotion, creativity. But generative AI can do none of these things. It has the form of human expression but no content.

The technology that runs under the hood of these tools is not fundamentally new. The mathematical models have changed in recent years, and new chips are making computation cheaper and more efficient, but ChatGPT only functions like a powerful autocomplete feature. Trained on an enormous amount of data, the model predicts which words

sky-high, further concentrating capital and technological knowledge in the hands of very few billionaires. As such, the field of AI is desperately in need of regulation. This is necessary not because tech companies might unleash a mathematical model that will suddenly become conscious and take over the world, but for the very real, boring reasons that have always existed: so they don’t take advantage of poorly paid temp workers, or refuse calls to be transparent with their algorithms, or flood social media with misinformation, or violate copyright laws by scraping the web for data without the permission of its owners. Sadly, these are things that Big Tech is already doing, and governments have been slow to act.

Fear, as populist politicians and headline writers know well, is best evoked by appealing to the unknown. Whether it’s the fear of AI-gone-rogue or the fear of falling behind in the race to

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Nudging A meta-analysis in behavioural science

many small effects, publication bias, Bayes/freq

Drought Climate change attribution

climate models, subgroup analyses, predictions

Women Co-authorship and gender

linear regression, binary outcome, confounding

Faces Human perception

sign test, regression, computational modelling

... What are the foundations of statistics?

- probability, analysis, applied mathematics modelling
- Bayes, Neyman, Fisher approaches to inference
- nature of uncertainty epistemic, empirical
- nature of induction belief functions, inferential models
- interpretation of p -values, confidence regions, credibility intervals, likelihood ratios
- role of sufficiency, ancillarity, conditioning, asymptotic theory
- sparsity, causality, assumption-free/lean inference, stability, prediction

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- realistic estimates of precision, complex dependencies, subgroup analyses
- out-of-sample predictions, sensitivity to assumptions

- statistical “workflows” seem to be emerging in different disciplines
 - e.g. Drought — “A Protocol for probabilistic extreme event attribution analysis ”
Philip et al 2020, *Adv. Stat. Clim. Met. Ocean*
 - e.g “Writing statistical methods for ecologists”
Davis & Kay 2023, *Ecosphere*
- tutorial-type articles in scientific journals
 - *Annals of Thoracic Surgery* — the statistician’s page
 - *J Am Medical Association* — Guide to Statistics and Methods
 - *Nature Methods* — Points of Significance
- “open data” observed in the breach
 - Drought — “Almost all the data are available via the KNMI Climate Explorer”
 - Women — “datasets generated ... are available at the Virtual Data Enclave Repository”
- sleuthing is hard

THANK YOU



Communication! — This just in

June 5, 2023



THE SCIENCE COMMUNICATIONS SOCIETY
Original URL:
<https://www.smartbrief.com/news/2023/06/05/precipitation-increase-52/>
Click to follow link.

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Study predicts extreme precipitation to increase by 52%

Precipitation events that deliver heavy rainfall or melted snowfall in one day are predicted to increase 52% in the Northeast by the end of the century, according to a study in Climatic Change. There will be a large increase in the number of days with extreme rain or snow, researchers predict, and a smaller increase in the amount of precipitation during each event, with extreme precipitation expected to happen mostly in winter and spring. **Full Story:** [New Hampshire Public Radio](#) (6/5)

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Human Cell Atlas project reveals new information about cellular function

Researchers working on the Human Cell Atlas project are learning more about how the placenta, immune system, brain, lungs and other organs function, and they have discovered thousands of new types of cells using single-cell genomics and advanced computational technology. The researchers have discovered how placental cells interact and function, identified a previously unknown lung cell type involved in cystic fibrosis, and identified two sets of nasal cells SARS-CoV-2 uses to infect people. **Full Story:** [The Guardian \(London\)](#) (6/3)


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US life expectancy has been declining for decades


A report in the American Journal of Public Health found US life expectancy has been steadily declining since the 1950s, and the COVID-19 pandemic further widened the gap between the US and other high-income nations, as the US recorded more deaths from the

Communication! — This just in

June 5, 2023



Sigma Xi
THE SCIENTIFIC SOCIETY OF WOMEN
Original URL:
<https://www.sigmaxi.org/smartbrief/>
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Falling Behind: The Growing Gap in Life Expectancy Between the United States and Other Countries, 1933–2021

You must log in or purchase access to view the full text. Log in and purchase options are available below.

Abstract

Objectives. To document the evolution of the US life expectancy disadvantage and regional variation across the US states.

Methods. I obtained life expectancy estimates in 2022 from the United Nations, the Human Mortality Database, and the US Mortality Database, and calculated changes in growth rates, US global position (rank), and state-level trends.

Results. Increases in US life expectancy slowed from 1950 to 1954 (0.21 years/annum) and 1955 to 1973 (0.10 years/annum), accelerated from 1974 to 1982 (0.34 years/annum), and progressively deteriorated from 1983 to 2009 (0.15 years/annum), 2010 to 2019 (0.06 years/annum), and 2020 to 2021 (–0.97 years/annum). Other countries experienced faster growth in each phase except 1974 to 1982. During 1933 to 2021, 56 countries on 6 continents surpassed US life expectancy. Growth in US life expectancy was slowest in Midwest and South Central states.

Conclusions. The US life expectancy disadvantage began in the 1950s and has steadily worsened over