

PSYCHOSTATISTICS

Newsletter of the Quantitative Methods Section of CPA

Message from the Chair

IN THIS ISSUE

- Msg from the Chair ... 1
- Student Rep Msg ... 2
- QM Laugh ... 2
- Visual Insights ... 3
- Consulting Corner ... 4
- Presentation Award ... 4
- 2018 Convention ... 5
- 2019 Invited Speaker ... 5
- QM Grad Programs ... 6
- Research Award ... 7
- QM Laugh x2 ... 7
- QM Executive ... 8/9

I am delighted to write this report after serving my first year as Chair of the Quantitative Methods section of CPA. We are small but mighty, and I have benefitted from a close-knit community of scholars spread across Canada who come together to work toward improving and amplifying the profile of quantitative psychology scholarship. We had lively discussions at last year's annual convention in Halifax. Like me, you may be disappointed not to be attending the convention this year in Montréal as planned, the CPA's first-ever cancellation and recent casualty of the global Covid-19 pandemic.

I see this unprecedented period of our history as a unique opportunity to highlight the critical importance of quantitative methods to public health and psychological well-being. Many quantitative psychologists have research programs that focus on improving the analytic tools we use to ensure that research

findings are accurate, measured well, and communicated accurately. At a time when misinformation runs rampant online, we are also fortunate to see many quantitative psychologists, statisticians, and data scientists countering with reliable, contextual, and comprehensible information.

I am reminded of a 2008 article published in *Psychological Science in the Public Interest* by Gerd Gigerenzer and his colleagues titled "Helping doctors and patients make sense of health statistics." The authors expertly illustrated the rampant problem of statistical illiteracy in society—not just among everyday citizens but among health care practitioners communicating statistical risks. Expressing *relative risks* can lead to confusion (e.g., whether the virus is "10 times more lethal" than the flu), whereas *absolute risks* and *natural frequencies* tell a clearer story (e.g., a risk of 1 in 1000 increases to 10 in 1000). Sorting out confusion is

among some of the most important work that quantitative methodologists do.

Our Section is hopeful that the many fascinating and timely sessions we were anticipating for this year's convention will make an appearance next year. The many submissions to our section this year included advances in measurement, effect size and uncertainty, meta-analysis, and a number of workshops on practical issues relevant to open science (reproducible results, R programming, and questionable measurement practices), to name a few. I hope to have the opportunity to attend these and other sessions at a future convention, but our Section will persist nonetheless in carrying out our mission to grow the visibility and scholarship of quantitative psychology in Canada.

*Andrea Howard
Chair, Quantitative
Methods Section*

Message from the Student Rep

QUANTITATIVE METHODS SECTION OF CPA

Website:
<https://canadianquantpsych.ca/>

Listserv:
qmcpa@yorku.ca

Twitter:
[@qm_cpa](https://twitter.com/qm_cpa)

My name is Mark Adkins and I am the Student Representative for the Quantitative Methods (QM) section. I am a PhD student in the Quantitative Methods Program within the Department of Psychology at York University.

My letter as the student representative last year focused on community, and this letter will reiterate that same focus. We are a community, and we are here to help each other however we can. I remember being a first-year master's student. If I had to cope with a global pandemic on top of my academic duties, then I am not convinced I would have made it through. As students, I urge you to reach out and check-in with each other. I also suggest connecting with a virtual academic community such as the *ReproducibiliTea* online

journal clubs which meet across the world and are open to anyone, especially early career researchers. They are a great way to connect with other students, learn something about how to integrate open science practices into your own research, and see that the whole world is in this pandemic together.

Given the current pandemic that has stretched across the globe, it should also come as no surprise that the CPA's 81st Annual National Convention has gone virtual. Regardless of whether this convention was to be your first or hundredth opportunity to present your work, we (as students) need to work together to support each other as we find our way through this difficult time. While this pandemic can affect us all differently, I want to emphasize that it is OK to not keep up with

your plans and goals (academic or otherwise). Remember, those goals were set pre-pandemic. Though we always strive to do our best work, keep in mind that the world has changed, and we must adapt with it. However, our adaptations must not come at the cost of our physical and mental health. There will always be pressure on undergraduate students, graduate students, and faculty alike to continue with "business as usual". Just remember that "business" has changed, and we should too. I'm excited to see what we learn together as our academic community shifts more heavily to virtual avenues by which we can disseminate our research findings.

*Mark Adkins,
Student Representative,
Quantitative Methods
Section*

QM Laugh



Did You Know?

CPA is very interested in increasing the number of QM workshops at the convention? Have an idea for a workshop? Tweet us at [@qm_cpa](https://twitter.com/qm_cpa).

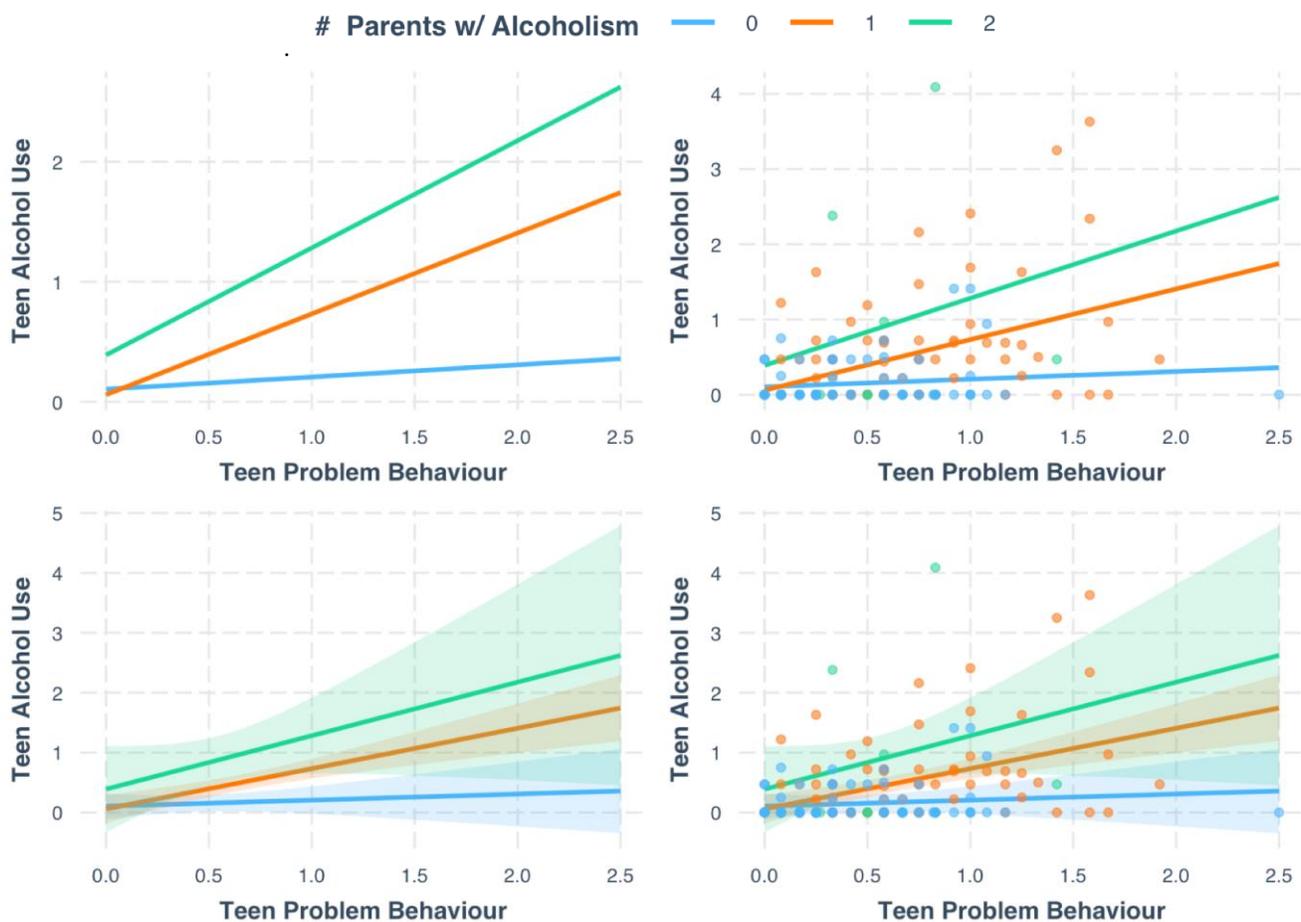
Visual Insights



Thank you to Alyssa Counsell from Ryerson University for this issue's *Visual Insights*.

Better Interaction Plots with R

Psychology researchers commonly test for interactions. Providing a graph of the interaction(s) immensely helps readers understand the pattern of results. That being said, not all interaction plots are created equal and some can be misleading. Take an example from David B. Flora's textbook *Statistical Methods for the Social and Behavioural Sciences* on whether the relationship between adolescents' problematic behaviour and their alcohol use depends on how many of their parents suffer from alcoholism. There is a statistically significant interaction in the regression model. Four different interaction plots are presented below. Each was created using the `interact_plot` function from the `interactions` package in R.



While the first plot is commonly presented in journal articles, it can be somewhat misleading. Including raw points in the plot allows readers to see whether extreme scores (outliers) could be affecting the slope estimates. Importantly, in this example, there are only 9 participants who have two parents with alcoholism. Each participant has a large amount of influence on the estimate of the slope, but there is also a large amount of uncertainty around that estimate. Including confidence bands provides important information about this uncertainty. Lastly, one could combine both of these elements (data points and confidence bands) to create the plot in the bottom right which illustrates the data in a fair and transparent way. For more information, resources, and tools for improving interaction plots, see:

McCabe, C. J., Kim, D. S., & King, K. M. (2018). Improving Present Practices in the Visual Display of Interactions. *Advances in Methods and Practices in Psychological Science*, 1(2), 147–165. <https://doi.org/10.1177/2515245917746792>

Consulting Corner

Question: I was wondering if you knew of a way of simulating data with a specific proportion correct and biserial correlation (Classical Test Theory, CTT, parameters). My current work around is converting CTT to Item Response Theory (IRT) parameters via Lords formula and then estimate the data using IRT and apply CTT methods. This has not been very accurate. The difficulty parameters seem accurate but the biserial correlations never are.

Response: Thank you very much for your query. Simulating correlated, non-normal data is a very active area of research and doing anything beyond the multivariate normal distribution tends to be complicated. Let us recall that the biserial correlation implies a bivariate distribution where the first unidimensional marginal is binary, the second unidimensional marginal is normal and there is a Pearson correlation coefficient inducing the dependency between the two.

For a setting like this, invoking the theory of copula distributions is ideal. In the simplest of terms, a copula distribution is a type of multivariate distribution that allows the user to model each univariate marginal and the joint distribution separately. In this case, one marginal is Bernoulli-distributed with parameter p (this is the proportion-correct or difficulty parameter), the other one is normal (assumed standardized) and the Pearson correlation is the biserial correlation. A Gaussian copula should suffice for this case. This R code example takes care of it:

```
library(mvtnorm) ##Helps set the Gaussian copula

##Parameters of interest
pop.biserial<-0.5
prop.correct<-0.3

##Need to solve this to get the right correlation
int_r_biserial<-pop.biserial/(dnorm(qnorm(1-prop.correct)))/
  sqrt(prop.correct*(1-prop.correct))

##Setting up the Gaussian copula.
X <- rmvnorm(n=1000000, mean = c(0,0),
  sigma=matrix(c(1,int_r_biserial,int_r_biserial,1),2,2))
u <- pnorm(X[,1])
x <- X[,2]
y <- qbinom(u, size=1, prob=prop.correct)
```

The correlation between y (binary) and x (normal) is the biserial correlation and should be close to 0.5 with a proportion-correct parameter of 0.3



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Thanks to Oscar Olvera Astivia, University of South Florida, for this Consulting Corner.

QM Section's 'Student Presentation Award'

Starting in 2016, the QM Section began awarding the best QM student presentation at each CPA meeting.

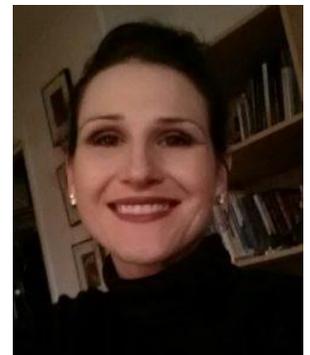
Previous winners were Alyssa Counsell (York University), Donna Tafreshi (Simon Fraser University), and Nataly Beribisky (York University).

Winners of the *Student Presentation Award* also receive a special invitation to publish their work in the *The Quantitative Methods for Psychology (TQMP)*.

The 2019 winner of the *Student Presentation Award* was Linda Farmus, a PhD student in the

Quantitative Methods program at York University. Linda's presentation was entitled *Incidence and Interpretation of Statistical Suppression in Psychological Research*.

Looking forward to all the great student presentations at *Virtual CPA 2020!*



QM at CPA 2019 ... Some Fantastic Presentations!

Invited Speaker Presentation

- **Modeling Response Styles and Aberrant Responding in Survey Data**, *Carl Falk, McGill University*

Workshops

- **Crash Course in Meta-Analysis**, *Robert Cribbie, York University*
- **Strategies for Improving Your Multiple Regression Analysis and Interpreting Your Results**, *Alyssa Counsell, Ryerson University; Andrea Howard, Carleton University*
- **Using Cloud-Based Statistics Applications to Enhance Statistics Education**, *Sean Mackinnon, Dalhousie University*

Research Talks

- **New Philosophical and Methodological Perspectives on the Reproducibility Crisis**, *Johnson Li, University of Manitoba; Virginia Tze, University of Manitoba*
- **Model-Based Measures for Detecting and Quantifying Response Bias**, *Robert (Philip) Chalmers, York University*
- **A Review of Traditional A Priori Power Analysis**, *Nataly Beribisky, York University; Udi Alter, York University; Robert Cribbie, York University*
- **Incidence and Interpretation of Statistical Suppression in Psychological Research**, *Linda Farmus, York University; Naomi Martinez Gutierrez, York University; Robert Cribbie, York University*
- **Probability-of-Superiority (PS) Reliability Assessment**, *Johnson Li, University of Manitoba*
- **The Importance of Distributional Assumptions in Power Analysis: Issues and Solutions**, *Oscar Olvera Astivia, University Of British Columbia; Edward Kroc, University Of British Columbia*
- **LagSequential: An Introduction to Six Programs for Analyzing Lag-Sequential Categorical Data In R**, *Zakary Draper, University of British Columbia; Brian O'Connor, University of British Columbia*

Posters

- **Evaluation of Reliability Estimates: The Dependence of Omega Hierarchical on a Correctly Specified Model**, *Marie-Louise Donohoe, York University; David Flora, York University*
- **Multivariate Multilevel Modeling of Growth with a Time-varying Covariate Assessed over a Partial Age Range**, *Andrea Howard, Carleton University*
- **A Comparison Of Limited-Information Fit Statistics for Response Style IRT Models**, *Joshua Starr, McGill University; Carl Falk, McGill University; Scott Monroe, University of Massachusetts, Amherst*

We Have a Website!!

Thanks to our Communications Director, Oscar Olvera Astivia, the QM Section now has a website at: <http://canadianquantpsych.ca>. Although the website is still in its infancy, and new content will be coming soon, we encourage you to check out the site and send any comments/suggestions regarding the site to quantmethodsblog@gmail.com. Currently you can find details regarding QM Section Awards, a list of QM Journals, past *Psychostatistics* newsletters, etc. Don't forget to also follow our Twitter account, @qm_cpa, and if you are not a member of our listserv (qm_cpa@yorku.ca) please send an email to Rob Cribbie (cribbie@yorku.ca) to get added so you don't miss any QM Section news.

QM Graduate Programs in Canada

University of Alberta

Centre for Research in Applied Measurement and Evaluation

<https://sites.google.com/ualberta.ca/crame>

Contact: Dr. Mark Gierl

Email: mark.gierl@ualberta.ca

University of British Columbia

MA/PhD, Quantitative Methods

<https://psych.ubc.ca/graduate/research-areas/quantitative-methods/>

Contact: Victoria Savalei

Email: vsavalei@psych.ubc.ca

MA/PhD, Measurement, Evaluation, and Research Methodology

<http://ecps.educ.ubc.ca/measurement-evaluation-and-research-methodology/>

Contact: Anita Hubley

Email: anita.hubley@ubc.ca

Carleton University

MA, Specialization in Data Science

PhD, Concentration in Quantitative Methods

<https://calendar.carleton.ca/grad/gradprograms/psychology/>

Contact: Andrea Howard

Email: andreaHoward@cunet.carleton.ca

University of Manitoba

MA/PhD Methodology

<http://home.cc.umanitoba.ca/~psycarea/programs/quantitative/index.html>

Contact: Johnson Li

Email: johnson.li@umanitoba.ca

McGill University

PhD, Quantitative Psychology and Modeling

<http://www.mcgill.ca/psychology/research-0/quantitative-modelling>

Contact: Heungsun Hwang

Email: heungsun.hwang@mcgill.ca

Simon Fraser University

MA/PhD, Quantitative Methods

<https://www.sfu.ca/psychology/areas/hqt.html>

Contact: Rachel Fouladi

Email: rfouladi@sfu.ca

Trent University

MSc, Applied Modeling and Quantitative Methods

<https://www.trentu.ca/amod/>

Contact: Dr. James Parker

Email: jparker@trentu.ca

York University

MA/PhD, Quantitative Methods

<http://qm.info.yorku.ca/>

Contact: Rob Cribbie

Email: cribbie@yorku.ca

If there are any programs that we missed that fall under the *Quantitative Methods for Psychology* umbrella, please contact any Executive member

Numerous resources related to the study of quantitative methods for psychology can be found on the APA Website:

<http://www.apa.org/research/tools/quantitative>

There you will find, among other things, that, relative to other areas of psychology, there is a much greater chance of getting a job with a PhD in Quantitative Methods.

Carl Falk: Winner of the *Quantitative Methods Research Award*

The QM Section recently began offering an award to recognize an outstanding research contribution on Quantitative Methods for Psychology by a Canadian (or affiliated) researcher. Specifically (from the by-laws):

This annual (calendar year) award will recognize excellence in a research study focusing on quantitative methods for psychology and published in a refereed scientific journal by a researcher in Canada (i.e., a researcher working at an institution in Canada, or an individual from outside Canada who is a member of the Section). The publication date of the article must match the award year.

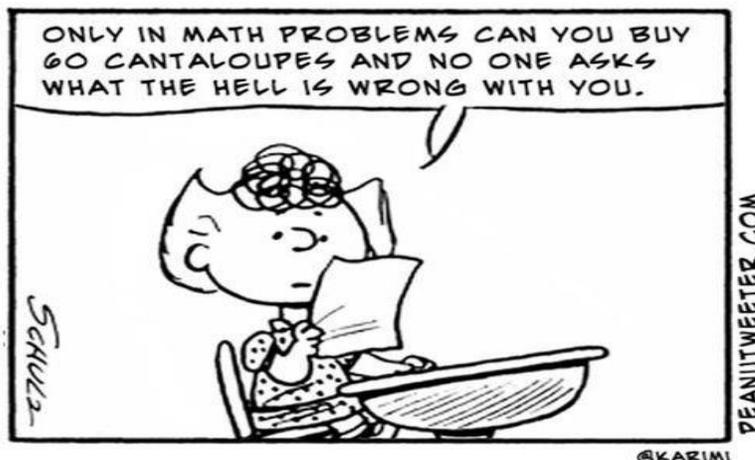
The 2018 winner of the Quantitative Methods Research Award was Carl Falk (McGill University) for his fantastic paper on interval estimation in structural equation model with nonnormal data.

Falk, C. F. (2018). Are Robust Standard Errors the Best Approach for Interval Estimation With Nonnormal Data in Structural Equation Modeling? *Structural Equation Modeling: A Multidisciplinary Journal*, 25, 244-266, DOI: 10.1080/10705511.2017.1367254.

The runner up was Victorial Savalei (University of British Columbia) for her work on fit indices with nonnormal data:

Savalei, V. (2018). On the Computation of the RMSEA and CFI from the Mean-And-Variance Corrected Test Statistic with Nonnormal Data in SEM. *Multivariate Behavioral Research*, 53, 419-429, DOI: 10.1080/00273171.2018.1455142.

The 2019 winner will be announced soon!



QM Section Executive Elections

Elections for QM Section positions on the Executive occur annually at the QM Business Meeting during the CPA Convention. Positions are available for both students and faculty/researchers. If you are interested in running for a position, or if you would like to nominate someone for a position, you can email executive members or nominations are also be accepted during the Business Meeting.

A list of available executive positions in the QM section can be found on pages 8 and 9.

Meet Your 2019–2020 QM Section Executive Team

Chair:

Andrea Howard
Department of Psychology
Carleton University
andrea.howard@carleton.ca



It was very unfortunate that the 2020 'in-person' CPA Convention was cancelled, but we hope everyone will participate in the 'virtual' Convention, either as a presenter or as a virtual audience member.

Chair-Elect:

Rob Cribbie
Department of Psychology
York University
cribbie@yorku.ca



Special Points of Interest

The QM Section of CPA was formed in 2013.

CPA 2021 is in Ottawa, CPA 2022 is in Calgary.

Past Chair:

Don Sharpe
Department of Psychology
University of Regina
sharped@uregina.ca



Want to Get Involved?

Email any of the members of executive - we'd love to have you!



Secretary/Treasurer:

Alyssa Counsell
Department of Psychology
Ryerson University
a.counsell@ryerson.ca



Communications

Director:

Oscar Olvera Astivia
Department of Psychology
University of South Florida
oscarolveraa@usf.edu

2020 Virtual CPA

Keep an eye on <http://cpa.ca/convention> for details regarding the *virtual* CPA Convention to be held online in July and August. There will be a number of QM presentations to check out with opportunities for Q&A with the presenters.



Student Representative:

Mark Adkins
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