Virtual Core Knowledge:
Biostatistics

Taehoon Ha, Biostatistician
(ha@cshl.edu)

01/21/2021 Thu.

Background

- Joined the Lab in September, 2020

- **EDUCATION**
  - B.S. in Applied Statistics and Business, Sungkyunkwan University, South Korea
  - M.S. in Applied Statistics, Duke University
  - M.S. in Biostatistics and Data Science, Weill Cornell Medicine

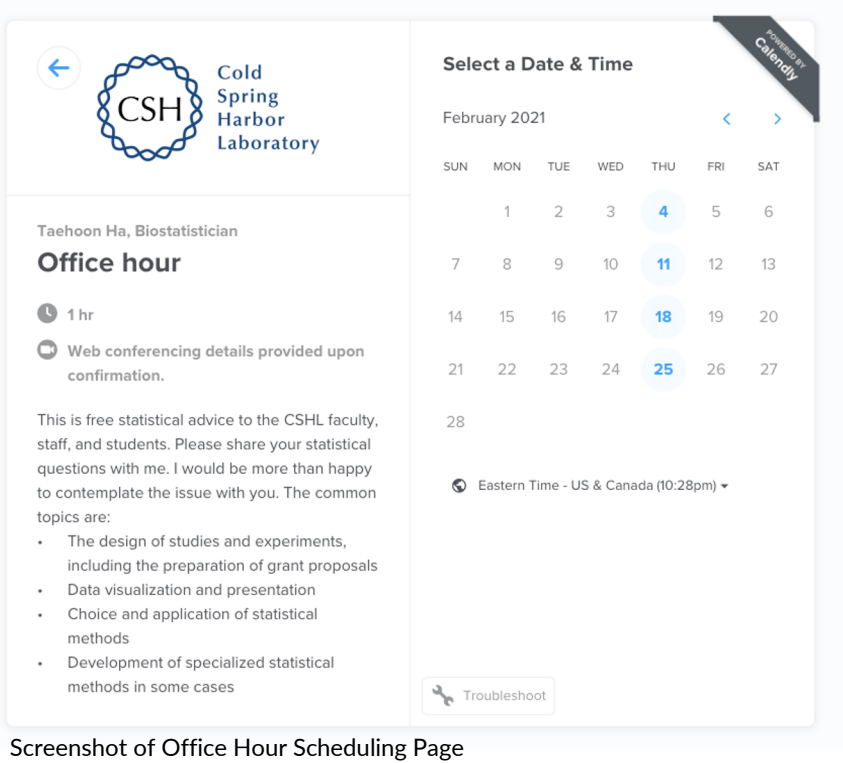
- **RESEARCH EXPERIENCE**
  - **Biostatistics**: Research Assistant at Weill Cornell Medicine
  - **Bioinformatics**: Volunteer Researcher: Bioinformatics Analyst at Johns Hopkins Bloomberg School of Public Health

- **OFFICE**: #3317, Matheson

Biostatistics Services Provided

1. Office Hours
2. Support Letters
3. Study Design and Power Calculations
4. Review/Writing of Methods Sections
5. Research Data Analysis
6. Research Collaborations

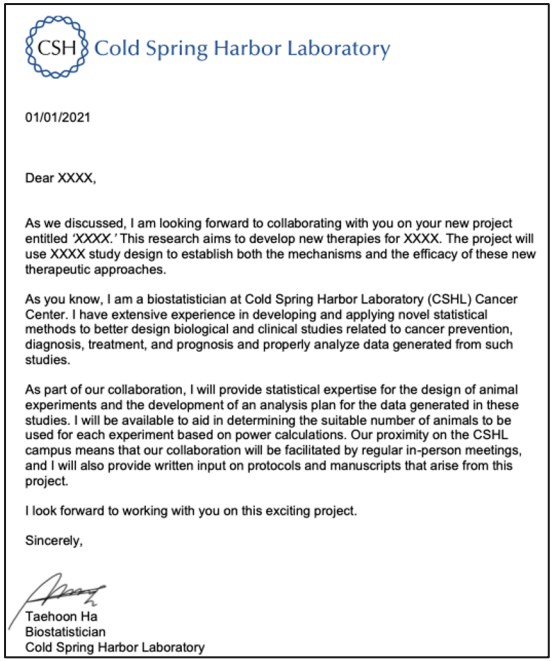
Office Hours: Thursday 2-4 PM



Screenshot of Office Hour Scheduling Page

- WHERE: calendly.com/cshlbiostat
- **FREE**: 1-hour statistical advice available to the Cancer Center faculty, staff, and students
  - Online-only until further notice
- **COVERAGE**: Short questions regarding study design, statistical analysis, or statistical software
- **INPUT**: Please share your details. The more concrete it is, the more I can be of help.
  - e.g., study overview deck, research questions, hypotheses, data, timeline/deadline, and etc.

Support Letters



Cold Spring Harbor Laboratory

01/01/2021

Dear XXXX,

As we discussed, I am looking forward to collaborating with you on your new project entitled '*XXXX*.' This research aims to develop new therapies for XXXX. The project will use XXXX study design to establish both the mechanisms and the efficacy of these new therapeutic approaches.

As you know, I am a biostatistician at Cold Spring Harbor Laboratory (CSHL) Cancer Center. I have extensive experience in developing and applying novel statistical methods to better design biological and clinical studies related to cancer prevention, diagnosis, treatment, and prognosis and properly analyze data generated from such studies.

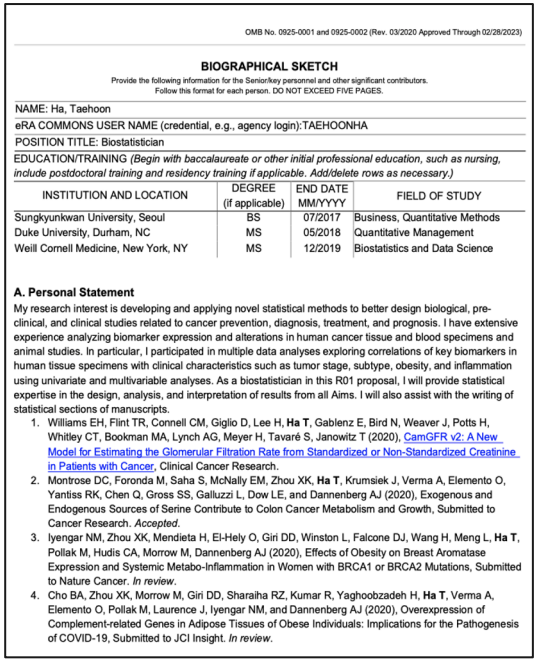
As part of our collaboration, I will provide statistical expertise for the design of animal experiments and the development of an analysis plan for the data generated in these studies. I will be available to aid in determining the suitable number of animals to be used for each experiment based on power calculations. Our proximity on the CSHL campus means that our collaboration will be facilitated by regular in-person meetings, and I will also provide written input on protocols and manuscripts that arise from this project.

I look forward to working with you on this exciting project.

Sincerely,

Taehoon Ha
Biostatistician
Cold Spring Harbor Laboratory

Example of Support Letter



OMB No. 0925-0001 and 0925-0002 (Rev. 03/2020 Approved Through 02/28/2023)

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. DO NOT EXCEED FIVE PAGES.

NAME: Ha, Taehoon

eRA COMMONS USER NAME (credential, e.g., agency login):TAEHOONHA

POSITION TITLE: Biostatistician

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	END DATE MM/YYYY	FIELD OF STUDY
Sungkyunkwan University, Seoul	BS	07/2017	Business, Quantitative Methods
Duke University, Durham, NC	MS	05/2018	Quantitative Management
Weill Cornell Medicine, New York, NY	MS	12/2019	Biostatistics and Data Science

A. Personal Statement

My research interest is developing and applying novel statistical methods to better design biological, pre-clinical, and clinical studies related to cancer prevention, diagnosis, treatment, and prognosis. I have extensive experience analyzing biomarker expression and alterations in human cancer tissue and blood specimens and animal studies. In particular, I participated in multiple data analyses exploring correlations of key biomarkers in human tissue specimens with clinical characteristics such as tumor stage, subtype, obesity, and inflammation using univariate and multivariable analyses. As a biostatistician in this R01 proposal, I will provide statistical expertise in the design, analysis, and interpretation of results from all Aims. I will also assist with the writing of statistical sections of manuscripts.

1. Williams EH, Flint TR, Connell CM, Giglio D, Lee H, **Ha T**, Gablenz E, Bird N, Weaver J, Potts H, Whitley CT, Bookman MA, Lynch AG, Meyer H, Tavaré S, Janowitz T (2020), CamGFR v2: A New Model for Estimating the Glomerular Filtration Rate from Standardized or Non-Standardized Creatinine in Patients with Cancer, Clinical Cancer Research.
2. Montrose DC, Foronda M, Saha S, McNally EM, Zhou XK, **Ha T**, Krumsiek J, Verma A, Elemento O, Yantiss RK, Chen Q, Gross SS, Galluzzi L, Dow LE, and Dannenberg AJ (2020), Exogenous and Endogenous Sources of Serine Contribute to Colon Cancer Metabolism and Growth, Submitted to Cancer Research. *Accepted*.
3. Iyengar NM, Zhou XK, Mendieta H, El-Hely O, Giri DD, Winston L, Falcone DJ, Wang H, Meng L, **Ha T**, Pollak M, Hudis CA, Morrow M, Dannenberg AJ (2020), Effects of Obesity on Breast Aromatase Expression and Systemic Metabo-Inflammation in Women with BRCA1 or BRCA2 Mutations, Submitted to Nature Cancer. *In review*.
4. Cho BA, Zhou XK, Morrow M, Giri DD, Sharaiha RZ, Kumar R, Yaghoobzadeh H, **Ha T**, Verma A, Elemento O, Pollak M, Laurence J, Iyengar NM, and Dannenberg AJ (2020), Overexpression of Complement-related Genes in Adipose Tissues of Obese Individuals: Implications for the Pathogenesis of COVID-19, Submitted to JCI Insight. *In review*.

Example of Biosketch Profile

- Biostatistics support letter and biosketch profile will be provided
- **Letters Provided Thus Far:**
  - David A. Tuveson (Oct. 2020)
  - Michael Luckey (Oct. 2020)
  - Nicholas Tonks (Nov. 2020)

Support Letters - Example

Dear XXXX,

As we discussed, I am looking forward to collaborating with you on your new project entitled 'XXXX.' This research aims to develop new therapies for XXXX. The project will use XXXX study design to establish both the mechanisms and the efficacy of these new XXXX approaches.

As you know, I am a biostatistician at Cold Spring Harbor Laboratory (CSHL) Cancer Center. I have extensive experience in developing and applying novel statistical methods to better design biological and clinical studies related to cancer prevention, diagnosis, treatment, and prognosis and properly analyze data generated from such studies.

As part of our collaboration, I will provide statistical expertise for the design of animal experiments and the development of an analysis plan for the data generated in these studies. I will be available to aid in determining the suitable number of animals to be used for each experiment based on power calculations. Our proximity on the CSHL campus means that our collaboration will be facilitated by regular in-person meetings, and I will also provide written input on protocols and manuscripts that arise from this project.

I look forward to working with you on this exciting project.

Study Design and Power Calculations

Study Design

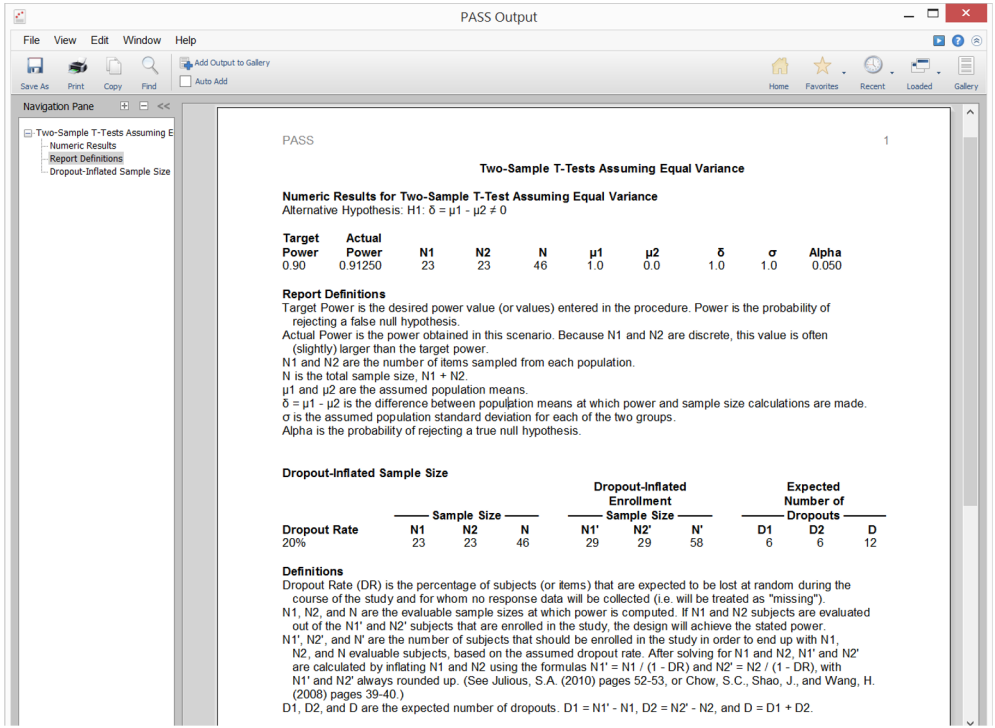
- Research hypotheses
- Source and sampled population
- Outcomes and how they are to be measured
- Potential predictors and confounders

Study Design and Power Calculations

- Source populations
- Clinically meaningful effect size for the primary hypothesis
- Level of precision or power required
- Estimates of variability and/or correlation from the literature or pilot data

Power Calculations

Study Design and Power Calculations - Example



Example of Power Calculations using PASS 2020 Software

- **Work Thus Far:**
  - David A. Tuveson (Oct. 2020)
  - David A. Tuveson (Dec. 2020)
  - Adrian R. Krainer + Qian Zhang (Dec. 2020)

Review/Writing of Methods Sections

- **Work Thus Far:**
  - Tobias Janowitz + Hannah Meyer + Edward H. Williams (Sep. 2020)
  - David A. Tuveson (Dec. 2020)

Research Data Aanlysis

- Data analysis services include the **selection and application of appropriate statistical methods, data visualization,** and **interpretations**

- **Work Thus Far:**
  - Christopher Hammell + Huiwu Ouyang (Nov. 2020)
  - Zachary Lippman + Xingang Wang (Dec. 2020)
  - Nicholas Tonks + Yuxin Cen (Dec. 2020)

Research Data Aanlysis - Example

- **Study Objective**: To identify a brand of disinfectant which has the best disinfection effect for surfaces in the campus cafeteria kitchens.
- **Study design**: There are 10 cafeteria kitchens and 10 surfaces are identified in each kitchen. For each kitchen, each surface is randomly assigned to be treated by one of the 5 brands of disinfectant so that each brand is used on two surfaces.
- **Study endpoint**: Bacterial contents counts on the treated surface.
- **Study hypothesis**: One/some brands of the disinfectant will perform better in disinfecting the kitchen surfaces.

bacteria	cafeteria	brand
6.092	1	A
5.810	1	A
4.504	1	B
4.346	1	B
5.163	1	C
2.723	1	C
4.671	1	D
3.051	1	D
2.515	1	E
-0.035	1	E
5.338	2	A
7.673	2	A
5.160	2	B
8.007	2	B
5.639	2	C

Research Data Aanlysis - Example

- Summary of bacterial levels by the brand of disinfectant:

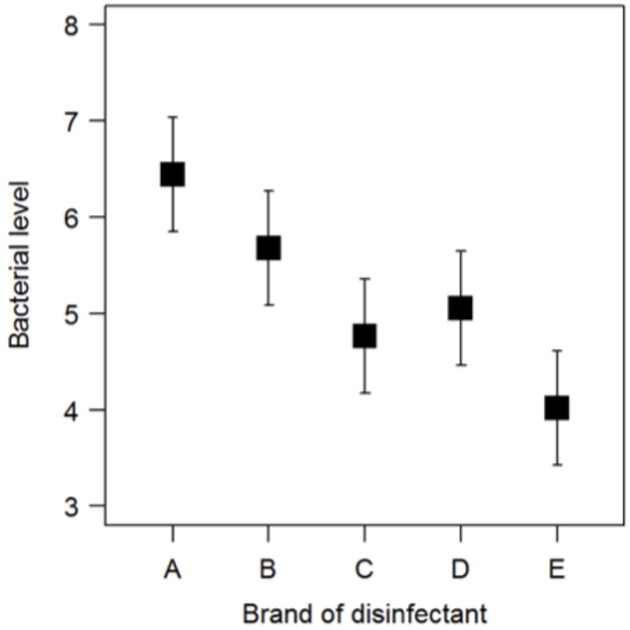
	n	mean +/- SD	95% CI
A	20	6.44 +/- 2.02	5.85, 7.04
B	20	5.68 +/- 1.87	5.09, 6.27
C	20	4.76 +/- 1.72	4.17, 5.36
D	20	5.05 +/- 1.74	4.46, 5.65
E	20	4.02 +/- 2.02	3.42, 4.61

- Summary of analysis results for comparisons of interest:

Comparisons	Est.Difference	95%CI.lwr	95%CI.upr	p.value	p.Tukey
B - A	-0.762	-1.941	0.418	7.37e-02	3.70e-01
C - A	-1.679	-2.858	-0.499	1.91e-04	1.69e-03
D - A	-1.390	-2.569	-0.210	1.61e-03	1.34e-02
E - A	-2.428	-3.607	-1.248	4.09e-07	5.51e-06
C - B	-0.917	-2.097	0.262	3.24e-02	1.96e-01
D - B	-0.628	-1.808	0.551	1.38e-01	5.62e-01
E - B	-1.666	-2.846	-0.487	2.11e-04	1.90e-03

Research Data Aanlysis - Example

- Graphical summary of the results:



Research Data Aanlysis - Example

- Text summary:

A linear regression model, with covariates including the disinfectant brand, the cafeteria kitchen and the brand by kitchen interaction, was used to estimate the bacterial levels on the kitchen surface post treatment with a brand of disinfectant. Two-way ANOVA was used to assess the overall differences in bacterial levels among surfaces treated by different brands of disinfectant. Pairwise comparisons were carried out to evaluate the differences in surface bacterial levels between pairs of disinfectant brands and p-values were adjusted for multiple comparisons by controlling the family-wise error rate using Tukey's method. The analysis was carried out using R version 3.6.3 (2020-02-29).

The analysis results showed significant difference in average surface bacterial levels among surfaces treated by different brands of disinfectant ($p<0.001$).

Additionally, the results showed that surfaces treated by disinfectant brand E had the lowest average bacterial level and this level was significantly different from the levels obtained with treatments by brand A ($p.adj<0.001$), brand B ($p.adj = 0.002$). Detailed summaries are provided in the tables and the graphs.

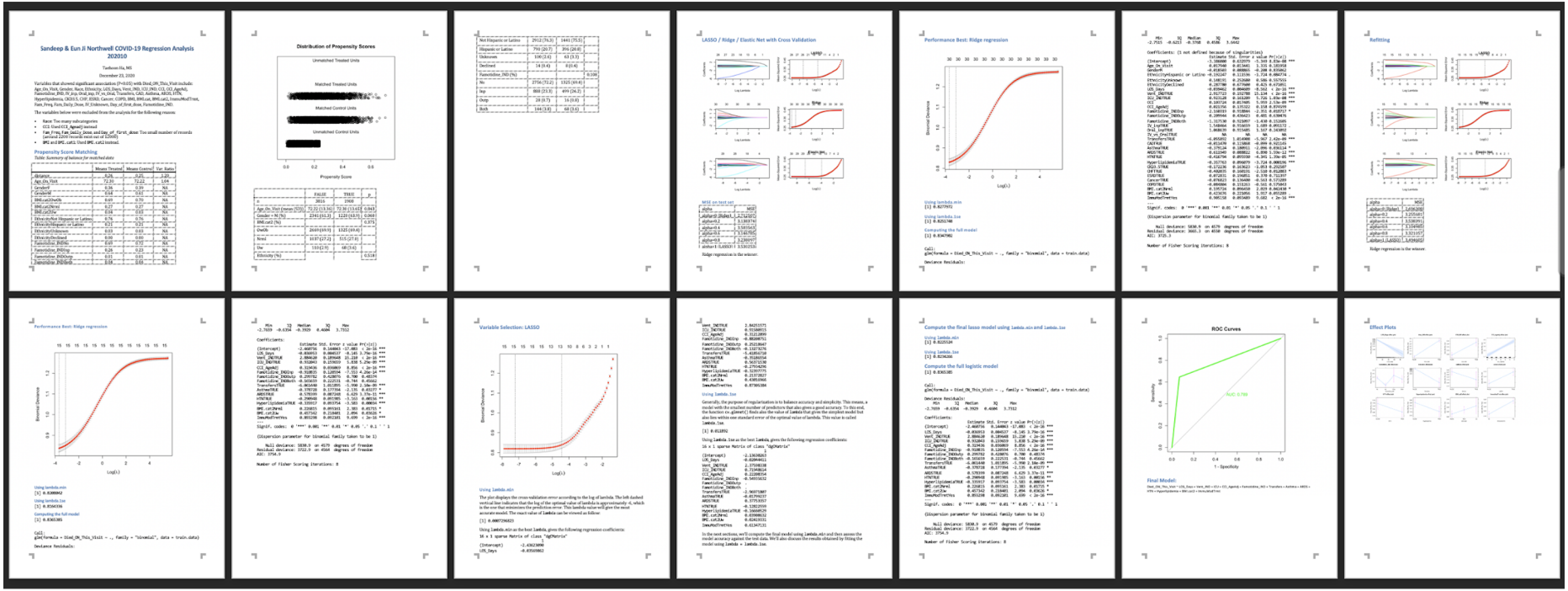
Research Collaborations

- **WHEN (e.g.):**
  - Developing a customized statistical model
  - Analyzing publicly available large-scale datasets
  - Contributing to a project from the initial step

- Require relatively longer timeline and more communications

- **Current Collaborations:**
  - Sandeep Nadella + Eun-Ji Kim (Oct. 2020)
  - Tobias Janowitz + Sam Kleeman (Dec. 2020)
  - Semir Beyaz + Hannah Meyer (Jan. 2021)

Research Collaborations - Example



Example of Study-Specific Model Development Project and Analysis Result Report in MS Word

Summary

- **Comprehensive Statistical Advice For Your Research**
  - From simple advice to complex data analysis

- **Future:** training sessions on statistical methods and software

Thank You

End of Document