

Mohanraj Krishnan, Ph.D.
Assistant Professor of Pennsylvania State University
Adjunct Assistant Professor at University of North Carolina at Chapel Hill

ADDRESS

Biobehavioral Health (BBH) Department
Pennsylvania State University
University Park
State College, Pennsylvania, 16802

Carolina Population Center
University of North Carolina at Chapel Hill
123 W. Franklin St.
Chapel Hill, North Carolina, 27516

EDUCATION

- 2018 **Doctor of Philosophy**
Genetics
University of Auckland, New Zealand.
Dissertation: **Genetic studies of Obesity in New Zealand: A Children of SCOPE study.**
Advisor: Professor Andrew Shelling
- 2011 **Masters of Science (MSc) with Distinction**
Genetics
University of Otago, New Zealand.
Dissertation: **Testing the Vitamin D₃ metabolic gene variants for association with gout in the New Zealand case-control sample-sets.**
Advisor: Professor Tony Merriman
- 2008 **Postgraduate Diploma of Science (PgDipSci) with Credit**
Microbiology
University of Otago, New Zealand.
- 2007 **Bachelor of Biomedical Sciences (BBioMedSci)**
Molecular Basis of Health and Disease
University of Otago, New Zealand.

PROFESSIONAL EXPERIENCE

- 2024 - present** Tenure track Assistant Professor
Biobehavioral Health and Cancer Institute
Pennsylvania State University
- 2024 - present** Adjunct Assistant Professor
Genetic Epidemiology
University of North Carolina at Chapel Hill
- 2022 - 2024** Postdoctoral Fellow
Carolina Population Center (CPC)

University of North Carolina at Chapel Hill

2019-2021

Postdoctoral Associate
Department of Human Genetics
Graduate School of Public Health
University of Pittsburgh

2018-2019

Postdoctoral Research Fellow
Department of Medicine and Obstetrics and Gynecology
University of Auckland, New Zealand

2012 – 2013

Research Assistant
Department of Medicine
University of Auckland, New Zealand
University of North Carolina at Chapel Hill

HONORS/AWARDS

2023

Recipient of the SPLENDOR-NC Scholar program: Supporting, Promoting, and Launching the Expansion of Nutrition, Diabetes, and Obesity Researchers in North Carolina.

2018

Sir John Logan Campbell (SJLC) Medical Fellowship for overseas collaboration at the University of Pittsburgh.

2017

Ko Awatea Counties Manukau Emerging Researcher Award, New Zealand.

2017

Ko Awatea Counties Manukau Best Obesity and Related Disease Presentation, New Zealand.

2017

Ko Awatea Counties Manukau People's Choice Award for Best Research, New Zealand.

2015

Oral finalist in the Exposure Postgraduate Research Exposition, University of Auckland, New Zealand.

2014

University of Auckland Doctoral Academic Career Module (DACM) Scholarship (fully paid year course), University of Auckland, New Zealand.

2014

Auckland Medical Research Foundation (AMRF) Emerging Researcher Award, University of Auckland, New Zealand.

2014

Auckland Medical Research Foundation (AMRF) travel grant.

2014

1st place of the University of Auckland HealthEx presentation (student organized conference designed to promote research activity and excellence in presentation).

2013

2nd place for the oral presentation in the University of Auckland. Gravida organized symposium, University of Auckland, New Zealand.

2013

University of Auckland, Liggins, Gravida PhD scholarship, University of Auckland, New Zealand.

GRANTS

2024

Co-Investigator of the Penn State Inter-Institutional Partnerships for Diversifying Research funding – "*Interdisciplinary Partnerships to Foster Health Equity in the Lower Rio Grande Valley*": (\$25,000).

2024

Recipient of the Trans-Omics for Precision Medicine (TOPMed) Fellowship – "*Leveraging integrative multi-omics to disentangle molecular mechanisms for severe obesity in diverse cohorts participating in Trans-Omics for Precision Medicine (TOPMed) Program*": (\$75,000).

2024

Recipient of the Pilot and Feasibility (P&F) award from SPLENDOR-NC – "*Proteomic Signatures of Severe Obesity in High-Risk Populations*": (\$50,000).

- 2018** Maurice and Phyllis Paykel Trust (MPPT) project grant to investigate – “*Favorable adiposity genes in Māori and Pacific (Polynesian) people*”: (\$14,000).
- 2015** University of Auckland Liggins Gravida additional funds grant for- “*Testing Copy Number Variations with Obesity Traits*”, (\$15,000).

PUBLICATIONS

**Co-first/senior authorship*

PUBLISHED OR IN-PRESS

17. Amitrano, F, **Krishnan M***, Murphy Rinki, Okesene-Gafa, K. A. M, Ji M, Thompson J.M.D, Taylor R.S, Merriman T.R, Rush E, McCowan M, McCowan L.M.E, McKinlay C.J.D. (2024). The impact of *CREBRF* rs373863828 Pacific-variant on infant body composition. *Sci Rep* **14**, 8825. <https://doi.org/10.1038/s41598-024-59417-5>.
16. Carlson, J.C, **Krishnan M**, Liu S, Anderson K.J, Zhang J.Z, Yapp T, Chiyka E.A, Dikec D.A, Cheng H, Naseri T, Reupena M.S, Viali S, Deka R, Hawley N.L, McGarvey S.T, Weeks D.E, Minster R.L. (2023). Improving imputation quality in Samoans through the integration of population-specific sequences into existing reference panels. *medRxiv*. doi: <https://doi.org/10.1101/2023.10.31.23297835>
15. Moors, J *, **Krishnan M***, Sumpter N., Takei R., Bixley M., Cadzow M., Major T.J., Phipps-Green A., Topless R., Merriman M., Rutledge M., Morgan B., Carlson J.C., Zhang J., Russell E.M., Guangyun S., Cheng H., Weeks D.E., Naseri T., Reupena M.S., Viali S., Tuitele J., Hawley N.L., Deka R., McGarvey S.T., Zoysa J., Murphy R., Dalbeth N., Stamp L., Taumoepeau M., King F., Wilcox P., Rapana N., McCormick S., Minster R.L., Merriman T.R., Leask M. (2023). A Polynesian-specific missense CETP variant alters the lipid profile. *HGG Adv*, 4(3), 100204. doi:10.1016/j.xhgg.2023.100204
14. Toomata, Z., Leask, M., **Krishnan, M.**, Cadzow, M., Dalbeth, N., Stamp, L.K., de Zoysa, J., Merriman, T., Wilcox, P., Dewes, O., and Murphy, R. (2023). Genetic testing for misclassified monogenic diabetes in Maori and Pacific peoples in Aotearoa New Zealand with early-onset type 2 diabetes. *Front Endocrinol (Lausanne)* **14**, 1174699. 10.3389/fendo.2023.1174699
13. **Krishnan M**, Phipps-Green A, Russell EM, Major TJ, Cadzow M, Stamp LK, et al. Association of rs9939609 in *FTO* with BMI among Polynesian peoples living in Aotearoa New Zealand and other Pacific nations. *J Hum Genet*. 2023 Mar 2. doi: 10.1038/s10038-023-01141-5. Epub ahead of print. PMID: 36864286.
12. Zhang JZ, Heinsberg LW, **Krishnan M**, Hawley NL, Major TJ, Carlson JC, et al. Multivariate analysis of a missense variant in *CREBRF* reveals associations with measures of adiposity in people of Polynesian ancestries. *Genet Epidemiol*. 2023;47(1):105-18.
11. Carlson JC, **Krishnan M**, Rosenthal SL, Russell EM, Zhang JZ, Hawley NL, et al. A stop-gain variant in *BTNL9* is associated with atherogenic lipid profiles. *HGG Adv*. 2023;4(1):100155.
10. Russell, E.M., Carlson, J.C., **Krishnan M.**, Hawley N.L., Sun G., Cheng H., Naseri T., Reupena M.S., Viali S., Tuitele J., Major T.J., Miljkovic I., Merriman T.R., Deka R., Weeks D.E., McGarvey S.T., Minster R.L. (2022). *CREBRF* missense variant rs373863828 has both direct and indirect effects on type 2 diabetes and fasting glucose in Polynesian peoples living in Samoa and Aotearoa New Zealand. *BMJ Open Diabetes Res Care*, Feb;10(1):e002275. doi: 10.1136/bmjdr-2021-002275. PMID: 35144939; PMCID: PMC884520
9. **Krishnan, M.**, Murphy, R., Okesene-Gafa, K. A. M., Ji, M., Thompson, J. M. D., Taylor, R. S., Merriman T R., McCowan L M E., McKinlay, C. J. D. (2020). The Pacific-specific *CREBRF* rs373863828 allele protects against gestational diabetes mellitus in Māori and Pacific women with obesity. *Diabetologia*, 63(10), 2169-2176. doi:10.1007/s00125-020-05202-8.

8. Metcalfe, L. K*, **Krishnan, M***, Turner, N., Yaghootkar, H., Merry, T. L., Dewes, O., Hindmarsh J H., De Zoysa J., Dalbeth N., Merriman T R., Smith G., Shepherd P., Murphy, R. (2020). The Maori and Pacific specific CREBRF variant and adult height. *Int J Obes (Lond)*, 44(3), 748-752. doi:10.1038/s41366-019-0437-6.

7. **Krishnan, M.**, Major, T.J., Topless, R.K., Dewes, O., Yu, L., Thompson, J.M.D., McCowan, L.E., de Zoysa, J., Stamp, L.K., Dalbeth, N., Hindmarsh, J.H., Rapana. N., Deka, R., Eng, W.W.H., Weeks, D.E., Minster, R.L., McGarvey, S.T., Viali, S., Wilcox, P., Grattan, D., Shepherd, P.R., Shelling, A.N., Murphy, R., Merriman, T.R. (2018). Discordant association of the CREBRF rs373863828 minor allele with increased body mass index and protection from type 2 diabetes in Māori and Pacific (Polynesian) people living in New Zealand. *Diabetologia*. 2018;61:1603-13.

6. Major T.J., **Krishnan, M.**, Topless, R.K., Dewes, O., Thompson, J.M.D., de Zoysa, J., Stamp, L.K., Dalbeth, N., Deka, R., Weeks, D.E., Minster, R.L., Wilcox, P., Grattan, D., Shepherd, P.R., Shelling, A.N., Murphy, R., Merriman, T.R. (2018). Comment: Re Widespread prevalence of a CREBRF variant amongst Māori and Pacific children is associated with weight and height in early childhood. *International Journal of Obesity*.

5. **Krishnan, M.**, Shelling, A. N., Wall, C. R., Mitchell, E. A., Murphy, R., McCowan, L. M. E., Thompson, J. M. D. & Children of, S. s. g. (2017). Gene-By-Activity Interactions on Obesity Traits of Six Year Old New Zealand European Children: A Children of SCOPE Study. *Pediatr Exerc Sci*, 1-55.

4. **Krishnan, M.**, Shelling, A. N., Wall, C. R., Mitchell, E. A., Murphy, R., McCowan, L. M. E., Thompson, J. M. D. & Children of, S. S. G. (2017). Gene-by-environment interactions of the CLOCK, PEMT, and GHRELIN loci with average sleep duration in relation to obesity traits using a cohort of 643 New Zealand European children. *Sleep Med* 37, NZRSTCV-092009 19-26.

3. **Krishnan, M.**, Thompson, J. M. D., Mitchell, E. A., Murphy, R., McCowan, L. M. E., Shelling, A. N. & On Behalf Of The Children Of Scope Study Group, G. (2017). Analysis of association of gene variants with obesity traits in New Zealand European children at 6 years of age. *Mol Biosyst*.

2. Vaidyanathan, V., Naidu, V., Kao, C. H., Karunasinghe, N., Bishop, K. S., Wang, A., Pallati, R., Shepherd, P., Masters, J., Zhu, S., Goudie, M., **Krishnan, M.**, Javed, A., Marlow, G., Narayanan, A. (Krishnan et al., 2017) & Ferguson, L. R. (2017). Environmental factors and risk of aggressive prostate cancer among a population of New Zealand men – a genotypic approach. *Mol Biosyst* 13, 681-698.

1. Bentley, R. W., Keown, D., Merriman, T. R., **Krishnan, M. R.**, Geary, R. B., Barclay, M. L., Roberts, R. L. & Day, A. S. (2011). Vitamin D receptor gene polymorphism associated with inflammatory bowel disease in New Zealand males. *Alimentary Pharmacology & Therapeutics* 33, 855-856.

UNDER REVIEW

Genome-wide association study identifies novel risk loci and provides new insights into genetic architecture of severe obesity.

Trans-ancestry Genome Wide Association Study (GWAS) of childhood body mass index identifies novel loci and age-specific effects.

High-Dimensional Multi-Omics characterization of severe obesity in Mexican Americans.

Socioeconomic disadvantage is associated with metabolite peaks linked to increased chronic disease risk: the Coronary Artery Risk Development in Young Adults (CARDIA) Study.

IN PREPARATION

Genome-wide association study of the human metabolome in diverse ancestries identifies ancestry-enriched associations of several loci in individuals with African ancestry.

Mendelian Randomization analysis of metabolites associated with severe obesity in the Hispanic Community Health Study/ Study of Latinos (HCHS/SOL).

INVITED TALKS

Severe Obesity and Diabetes (2024) North Carolina Diabetes Research Center (NCDRDC) Faculty Development Workshop, Union Square Campus in Greensboro, NC, USA.

Adiposity in the Antipodes: Joining forces to tackle metabolic diseases in the Pacific Islands (2023), Wake Forest University, Winston Salem, NC, USA.

The genetics of severe obesity in diverse populations (2023), Demography Daze, Duke University, NC, USA.

Association of gene variants with obesity traits in New Zealand European children (2015), King's College, London, England.

The evolution of obesity- a genetics perspective, Gravida Symposium (2014), University of Auckland, Auckland, New Zealand.

CONFERENCE PROCEEDINGS

PLENARY:

Krishnan M, Murphy R, McKinlay C, Okesene-Gafa K, Ji M, Thompson J.M.D, Taylor R, Merriman T.R, McCowan L.M.E (2019) The *CREBRF* Type 2 Diabetes protective allele is associated with reduced risk of Gestational Diabetes Mellitus in Māori and Pacific women with obesity. Paper presented at the 23rd Annual Congress of the Perinatal Society of Australia and New Zealand (PSANZ), Gold Coast, Queensland, Australia (2019).

POSTER

Spor L.M, Carlson J.C, Wehr J, Russell E.M, **Krishnan M**, Liu S, Cheng H, Naseri T, Reupena M.S, Viali S, Tuitele J, Kershaw E.E, Deka R, Hawley N.L, McGarvey S.T, Weeks D.E, Minster R.L (2024), Variation of multi-ancestry polygenic scores for lipid levels in 3,119 participants from Samoa and American Samoa. Paper presented at the 74th meeting of the American Society of Human Genetics, Denver, Colorado.

Frankel E, Petty L, Roshani R, Zhu W, Hsin-Chen H, Yaser M, Graff M, **Krishnan M**, Buchanan V, Lee M, Guittirrez A, Highland H.M, Young K.L, McCormick J.B, Fisher-Hoch S.P, North K.E, Below J.E (2024), Multi-omic characterization of persons living with T2D in a vulnerable Hispanic/Latino population. Paper presented at the 33rd annual meeting of the International genetic Epidemiology Society meeting, Denver, Colorado.

Frankel E, Petty L, Roshani R, Zhu W, Hsin-Chen H, Yaser M, Graff M, **Krishnan M**, Buchanan V, Lee M, Guittirrez A, Highland H.M, Young K.L, McCormick J.B, Fisher-Hoch S.P, North K.E, Below J.E (2024), Multi-omic characterization of persons living with T2D in a vulnerable Hispanic/Latino population. Paper presented at the 74th meeting of the American Society of Human Genetics, Denver, Colorado.

Yapp T.J, **Krishnan M**, Liu S, Manna S.L, Cheng H, Naseri T, Reupena M.S, Viali S, Tuitele J, Deka R, Hawley N.L, McGarvey S.T, Weeks D.E, Minster R.L, Carlson J.C (2024) Genome-wide association studies of blood pressure phenotypes in 4,819 participants from Samoa and American Samoa. Paper presented at the 74th meeting of the American Society of Human Genetics, Denver, Colorado.

Yaser M, Graff M, Frankel E, Roshani R, Zhu W, Hsin-Chen H, Gordon-Larsen P, **Krishnan M**, Petty L, Buchanan V, Lee M, Guitierrez A, Highland H.M, Young K.L, McCormick J.B, Fisher-Hoch S.P, Below J.E, North K.E (2024) Characterization of the Obese Proteome and Downstream Sequelae in Hispanic Latino Study Participants. Paper presented at the 74th meeting of the American Society of Human Genetics, Denver, Colorado.

Krishnan M, Anwar M.Y, Justice A.E, Chittoor G, Chen H, Smit A.J.S, Preuss M, Parra E, Cruz M, Hui Q, Wilson P, Sun Y, Zhao W, Smith J, Lange L, Meyer M, Liu C, Yanek L, Loos R, North K.E, Graff M (2023) Genome-wide association study identifies novel risk loci and provides new insights into genetic architecture of severe obesity. Paper presented at Network of Minority Health Research Investigators (NMRI), Washington D.C.

Krishnan M, Anwar M.Y, Justice A.E, Chittoor G, Chen H, Smit A.J.S, Preuss M, Parra E, Cruz M, Hui Q, Wilson P, Sun Y, Zhao W, Smith J, Lange L, Meyer M, Liu C, Yanek L, Loos R, North K.E, Graff M (2023) Genome-wide association study identifies novel risk loci and provides new insights into genetic architecture of severe obesity. Paper presented at the 73rd meeting of the American Society of Human Genetics, Washington D.C.

Yapp T.J, Zhang J.Z, **Krishnan M**, Liu S, Blobner B.M, Cheng H, Naseri T, Reupena M.S, Viali S, Tuitele J, Deka R, Hawley N.L, McGarvey S.T, Weeks D.E, Minster R.L, Carlson J.C (2023) Genome-wide association studies of blood pressure phenotypes in 4,819 participants from Samoa and America Samoa. Paper presented at the 73rd meeting of the American Society of Human Genetics, Washington D.C.

Carlson J.C, **Krishnan M**, Liu S, Anderson K, Zhang J.Z, Cheng H, Naseri T, Reupena M.S, Viali S, Deka R, Hawley N.L, McGarvey S.T, Weeks D.E, Minster R.L (2023) The extent to which augmenting extant reference panels with population-specific sequences improves imputation quality. Paper presented at the 73rd meeting of the American Society of Human Genetics, Washington D.C.

Petty L.E, Chen H, Sharma P, Polikowsky, Seo J, Anway M.Y, Kim D, Graff M, Young K.L, Zhu W, Karastergiou K, Shaw M.D, Justice A.E, Fernández-Rhodes L, **Krishnan M**, Gutierrez A, McCormick P, Gordon-Larsen P, Lee M, Highland H.M, Gamazon E.R, Cox N.J, Fried S.K, Fisher-Hoch S, McCormick J, North K.E, Below J.E (2023) Multi-omics reveal key molecular signatures of severe obesity. Paper presented at the 73rd meeting of the American Society of Human Genetics, Washington D.C.

Young K.L, Buchanan V.L, Graff M, **Krishnan M**, Highland H.M, Yu B, Avery C.L, Buyske S, Cai J, Daviglius M, Howard A.G, Isasi C.R, Kaplan R, Loos R.J.F, Qi Q, Rohde R, Rotter J.I, Van Horn L, Gordon-Larsen P, Bowerwinkle E, North K.E (2023) Mendelian Randomization analysis of metabolites associated with severe obesity in the Hispanic Community Health Study/ Study of Latinos (HCHS/SOL). Paper presented at the 28th meeting of the Cohorts for Heart and Aging Research in Genomic Epidemiology, Boston, Massachusetts.

Krishnan M, Howard A.G, Highland H.M, Lloyd-Jones D, Rushing B, Sumner S, North K.E, Gordon-Larsen P, Avery C.L, Graff M (2022) Genome-wide association study of the human metabolome in diverse ancestries identifies an association of the *OPLAH* locus with 5-oxoproline (pyroglutamic acid) in individuals with African ancestry. Paper presented at the 27th meeting of the Cohorts for Heart and Aging Research in Genomic Epidemiology, Seattle, Washington.

Krishnan M, Howard A.G, Highland H.M, Lloyd-Jones D, Rushing B, Sumner S, North K.E, Gordon-Larsen P, Avery C.L, Graff M (2022) Genome-wide association study of the human metabolome in diverse ancestries identifies an association of the *OPLAH* locus with 5-oxoproline (pyroglutamic acid) in individuals with African ancestry. Paper presented at the 72nd meeting of the American Society of Human Genetics, Los Angeles, California.

Krishnan M, Taub M.A, Carlson J.C, Cheng H, Naseri T, Reupena M, Deka R, Hawley N.L, McGarvey S.T, Weeks D.E, Mathias R.A, Minster R.L, TOPMed Hematology & Hemostasis and Structural Variation Working

Groups (2020) Genome-wide association study of telomere length in individuals of Samoan ancestry. Paper presented at the 70th meeting of the American Society of Human Genetics, Virtual.

Krishnan M, Leask M, Major T.M, Carlson J.C, Zhang J.Z, Russell E.M, Minster R.L, Weeks D.E, Hawley N.L, Naseri T, Reupena M.S, Deka R, Cheng H, McGarvey S.T, Dalbeth N, Zoysa J, Murphy R, Stamp L, Hindmarsh J.H, Merriman T.R, Moors J, TOPMed Lipids Working Group (2019) A novel variant in CETP is associated with higher HDL-cholesterol in people of Polynesian ancestry. Paper presented at the 69th meeting of the American Society of Human Genetics, Houston, Texas.

Krishnan M, Phipps-Green A, Altaf S, Major T.J, Cadzow M, Stamp L, Dalbeth N, Russell E.M, Minster R.L, Hawley N.L, Naseri T, Reupena M.S, Deka R, Weeks D.E, McGarvey S.T, Merriman T.R, Murphy R (2018) *FTO* in the Polynesians: Association of *FTO-rs9939609* with body mass index in a fixed-effect meta-analysis in people of Polynesian ancestry living in Aotearoa/New Zealand and other Pacific nations. Paper presented at the 68th meeting of the American Society of Human Genetics, San Diego, California.

Krishnan M, Murphy R, Major T.M, Shepherd P, Grattan D, Yu L, Dalbeth N, Stamp L, Weeks D.E, Thompson J.M.D, Shelling A.N, McGarvey S.T, Merriman T.R (2017) Higher body mass index but lower type 2 diabetes prevalence in New Zealand Polynesian populations carrying *CREBRF-rs373863828* variant. Paper presented at the 5th meeting of the European Association for the study of Diabetes-Study Group for the Genetics of Diabetes, Leiden, Netherlands.

Krishnan M, Thompson J.M.D, Wall C, Mitchell E.A, McCowan L.M.E, Shelling A.N (2015) Analysis of association of gene variants with obesity traits in New Zealand European children at 6 years of age: a Children of SCOPE study. INFANT Symposium. Cork, Ireland.

TEACHING EXPERIENCE

Teaching Assistant (2023)
EPID743,
“Genetic Epidemiology”,
Department of Epidemiology,
University of North Carolina at Chapel Hill, NC, USA.

Guest Lecturer (2024),
EPID 889,
“Introduction to Plotting and Visualizing using R”,
Department of Epidemiology,
University of North Carolina at Chapel Hill, NC, USA.

Guest Lecturer (2023),
EPID 889,
“Metaboanalyst and Pathway Enrichment using Metabolomics data”,
Department of Epidemiology,
University of North Carolina at Chapel Hill, NC, USA.

Undergraduate Lecturer,
Department of Medicine,
University of Auckland, New Zealand.

Undergraduate Lecturer,
Department of Biochemistry,
University of Otago, New Zealand.

PROFESSIONAL SERVICE

- 2021** Organizer for the Department of Human Genetics Journal club, University of Pittsburgh, USA.
- 2021** Judge of the American Society of Human Genetics Annual Day DNA Essay Contest.
- 2015-2017** Editor of HealthEx; student organized conference designed to promote research activity and excellence in presentation.

COMMUNITY ENGAGEMENT

M. Krishnan Impact of the *CREBRF* gene variant in Māori and Pacific people (2018) Tātai Oranga. Molecular approaches to understanding metabolic diseases. Iritekura Marae, Waipiro Bay.

To disseminate the research to the Māori and Polynesian people who participated in the study and to provide a Pacific perspective on joining forces with communities to tackle metabolic diseases.

Interviewed by the New Zealand Herald (New Zealand's national newspaper) on my doctoral project: Exercising in Pregnancy under SCOPE; New Zealand Herald (2014).