

Gut bacteria linked to mental health, other chronic disease risks among NHPI populations

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Ph.D. student Brennan Yamamoto performs a type 2 diabetes test on a sample from a study participant. Credit: University of Hawaii at Manoa

A potential link between intestinal bacteria and the disproportionately higher rates of certain chronic disease and mental health risks among Native Hawaiians and other Pacific Islanders (NHPIs) has been

discovered by an interdisciplinary team of researchers from the University of Hawai'i at Mānoa. The new findings were published in *Frontiers in Cellular and Infection Microbiology* and *Frontiers in Genetics*.

Researchers from UH Mānoa's John A. Burns School of Medicine (JABSOM) and the University of Hawai'i Economic Research Organization (UHERO) in the College of Social Sciences have identified key differences in the numbers and types of [intestinal bacteria](#) strains in NHPIs that track with age, type 2 diabetes status, body mass index and [self-esteem](#). Using these profiles, they identified specific features that may partially regulate the [biological processes](#) that impact mental health and metabolic conditions that appear to be related to inflammation, and may help explain the higher incidences of depression and diabetes among NHPIs. Examples of these findings include:

- A novel interaction between self-esteem and abundance of Veillonellaceae bacteria, where increased levels of this bacteria in the gut corresponded to a significant increase in self-esteem, with individuals with low self-esteem (a risk factor for depression) showing abnormally low levels of this bacteria.
- Shared imbalance of Bacteroidetes between diabetes and obesity, where its abundance was observed to decrease with poor glycemic control and increase with obesity.
- A significant and specific deficiency in the levels of butyrate-producing bacteria in the gut of pre- and diabetic participants, that corresponded to increased systemic inflammation.
- A novel significant association between the levels of Cyanobacteria (which produces toxins and implicated in cancer risk in Hawai'i) and poor glycemic control, with overabundance of this bacteria in the gut of diabetic participants.
- A significantly higher gut microbial diversity in obese and diabetic individuals of NHPI ancestry. This contrasts with the relationship observed between obesity and diabetes in other

ethnic/race groups previously reported in other studies.

The new research is based on survey findings from a cohort of more than 500 Hawai'i residents statewide. The surveys were conducted by UH's Hawai'i Social Epigenomics of Early Diabetes Cohort (HI-SEED) project and designed to identify novel biomarkers predictive of the development of diabetes in order to enable prevention and restore health equity in the islands.

The results indicate that biological findings from other ethnic/race groups may not necessarily be generalizable to the NHPI population and highlight the importance of increasing representation of NHPIs in social and biomedical research studies.

"Your [gut microbiome](#) is affected by what you eat and your environment, and for the first time, we have uncovered differences in Native Hawaiian and Pacific Islanders that contrast with findings from other populations. This may better explain higher rates of chronic health conditions such as diabetes among NHPIs that cannot be explained by social environmental factors alone," said report co-author Alika Maunakea, associate professor at the Department of Anatomy, Biochemistry and Physiology at JABSOM.

According to the Hawai'i State Department of Health, NHPIs suffer disproportionately higher rates of and deaths from type 2 diabetes than any other major race/ethnic group in the state. In 2018, the age-adjusted diabetes death rate among NHPIs was more than 2.5 times higher than that of the general state population. Studies have also shown that NHPI have a higher prevalence of depressed moods, [suicidal ideation](#) and attempts and illicit drug use, but are three times less likely to receive mental health services and treatment compared to non-Hispanic white people. While existing research has described social determinants of [mental health](#) in this population, little is known about the biological

mechanisms underlying the disproportionately higher rates of [low self-esteem](#) related to depression among NHPIs.

"Our findings have significant implications for personalized medicine and improved strategies to enable interventions aimed at preventing chronic disease outcomes, especially among NHPIs. In working with NHPI-led community-based organizations, we are already observing some promising results of such strategies," added co-author Ruben Juarez, HMSA Endowed Professor in Health Economics in UHERO.

Preventing chronic diseases among NHPIs

One example is a partnership with MA'O Organic Farms, which is located in Wai'anae with a dense NHPI population. The MA'O Organic Farms' Youth Leadership Training (YLT) program connects 'āina (that which feeds) and 'ōpio (youth) to create a local food system that incorporates education, healthy lifestyle and socioeconomic development. YLT interns experience improvements in attaining higher-level education, nutrition, physical activity, access to health care and cultural literacy, potentially reducing the risk of chronic disease conditions prevalent in that community. The pilot program has shown to reduce the risk for [diabetes](#) among oncoming YLT interns after a year in the program.

More information: Riley K. Wells et al, Gut microbial indicators of metabolic health underlie age-related differences in obesity and diabetes risk among Native Hawaiians and Pacific Islanders, *Frontiers in Cellular and Infection Microbiology* (2022). [DOI: 10.3389/fcimb.2022.1035641](https://doi.org/10.3389/fcimb.2022.1035641)

Celyna Y. Becerra et al, Examining the immunoepigenetic-gut microbiome axis in the context of self-esteem among Native Hawaiians and other Pacific Islanders, forthcoming in *Frontiers in Genetics* (2023). [DOI: 10.3389/fgene.2023.1125217](https://doi.org/10.3389/fgene.2023.1125217). [www.frontiersin.org/articles/1 ...](https://www.frontiersin.org/articles/1...)

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