

Socioeconomic Status and Its Impact on the Microbiome

Eva Koplín, Sydney Wiswell, Abby Zoromski, SarahJean O'Neill, & Cameron Haines

Introduction:

Diversity in the microbiome is vital to overall health, as they play a role in metabolism, health of the immune system, and nutrient absorption etc. The gut microbiome, or the gut flora, consists of millions of microorganism and bacteria that are found in the human intestine. They play a part in digestion, the immune system, and other important bodily functions. Many research studies have focused on how genetics play a major role on the microbiota, while environmental factors, such as a socioeconomic statuses, are not as heavily emphasized. However, it is essential for researchers to investigate how these outside factors affect the microbiota to create guidelines for a healthier gut flora, which in turn could lead to increased public health. However, So, how does the microbiota differ with socioeconomic status? The According to United Nations, about 33% of the world's population lives in poverty. (HDR 2016). Individuals with higher socioeconomic status have been shown to have different microbiota composition than individuals with lower socioeconomic status. While this pattern has been observed around the world, this research on microbiome diversity has yet to be heavily explored and applied in American communities. We hypothesize that Americans of lower socioeconomic status will have a more diverse gut flora than Americans of higher socioeconomic status, due to differences in diet and lifestyle.

Hypothesis

We hypothesize that Americans of lower socioeconomic status will have a more diverse gut flora than Americans of higher socioeconomic status, due to differences in diet and lifestyle

Methods

For our project we used University of Wyoming Library scholarly research engines, such as Web of Science and Proquest to make sure our articles were peer reviewed and up to date. We searched for articles pertaining to how individuals in different socioeconomic statuses have differing microbiota compositions. While using the databases, we filtered the articles to only show ones published within the past ten years. We found an article from November 2016 which studied individuals from the same area but of different socioeconomic statuses in Malaysia. We found a second article investigating the relationship of socioeconomic status, this time in Brazil, looking at children living in slums compared to children attending private schools, showing a stark contrast in SES we were looking for. This second article pertained directly to our hypothesis, therefore this piece of literature was the center of our research. However, we did find another article studying social statuses and the microbiota; this research was conducted in Malaysia. While reading through these articles, we looked at the studies that were referenced to guide us to other articles and research to back up our findings. After learning about the outcomes of these studies, we were able to apply the research and predict how the microbiota differs with socioeconomic status in America.



Example of a low SES meal option more common in Malaysia or Brazil.

(<http://montreal.com/wild-game-meat-coming-soon-to-montreal/>)



A more common low SES meal option in America.

(https://www.alternet.org/sites/default/files/styles/story_image/public/story_images/51552-burger-and-fries.jpg?itok=BGIS3WBu)

Summary of Findings:

One study in Sao Paulo, Brazil researched the gut microbiota differences in individuals of high and low socioeconomic statuses by comparing children who live in the slums to children who attended private schools. Furthermore, the researchers looked at factors pertaining to the socioeconomic status such as sanitation and living conditions of the individuals. The researchers identified the intestinal bacterial population through DNA extraction and sequencing, primarily of the 16s ribosomal RNA. The private school (high SES) children were shown to have greater *S. aureus* and *C. difficile* populations, while *Lactobacillus* spp., *E. coli*, and *M. smithii* were found in greater concentrations in the children who lived in the slums (low SES). Overall, the children with higher socioeconomic status were found to have a less favorable gut microbiota than children who lived in the slums. (Chong, Chun Wie, et al. 2016) The greater diversity of gut microbes was responsible for the favorability of the low SES micro biome. Similar findings were recorded from a study done in Malaysia. Balanced gut flora populations in lower SES individuals were found with high diversity.

Example of two bacteria found in gut of low SES individuals in Malaysia study
Bacteroidetes and *deltaproteobacteria*



Discussion:

→Our research analysis would lead us to the initial conclusion that an individual of lower socioeconomic status in the US would, like an individual in the slums of Malaysia or Brazil, have a more diverse microbiome than an individual of higher socioeconomic status. This would allow us to fail to reject our hypothesis—lower SES individuals in the US will have a more favorable microbiome too, BUT:

→It is essential to understand what "poverty" means in Malaysia and Brazil. People who live in slums and are of lower socioeconomic statuses in countries around the world most likely do not have a "western" (processed) diet.

→Without processed foods, a diverse diet is prevalent. Foods come from wild game, other wild foods, and home gardens.

→However, processed, fatty foods dominates the American diet, for all socioeconomic statuses (Grub Street 2016). Whereas the diet of a lower SES individual even several decades ago could have consisted of more garden fresh vegetables and wild game, it now tends to be easy-to-access food and tends to be more processed and have less variety (think fast food).

→In America, an individual who is identified to be of "lower class" will be different than an individual who lives in the slums of Malaysia and Brazil. These studies suggested that sanitation and diet play the greatest role pertaining to the diversity of the gut microbiota. When applying these studies to American, it is important to note that lower socioeconomic status is commonly associated with more processed foods, meaning the results will likely not be the same as in places like Malaysia and Brazil; the opposite may even be true, that individuals of lower socioeconomic status have less favorable gut flora. Further cross-culture research investigating how SES can affect the gut microbiota must be done throughout different American communities to conclude these speculations.

References

Chong, Chun Wie, et al. "Effect of ethnicity and socioeconomic variation to the gut microbiota composition among pre-Adolescent in Malaysia." *Scientific Reports*, vol. 5, no. 1, 2016, doi:10.1038/srep13338.

Mello, Carolina S., et al. "Gut Microbiota Differences in Children from Distinct Socioeconomic Levels Living in the Same Urban Area in Brazil." *Journal of Pediatric Gastroenterology and Nutrition*, vol. 63, no. 5, 2016, pp. 460-465, MEDLINE®; MEDLINE®, <http://libproxy.uwyo.edu/login?url=https://search.proquest.com/docview/1826662135?accountid=14793>.

Knight, Rob. *Follow your Gut*. TED Books, Simon and Schuster, 2015. Print.

"Human Development Reports." *Multidimensional Poverty Index (MPI) | Human Development Reports*, 2016, hdr.undp.org/en/content/multidimensional-poverty-index-mpi.

Mosites, E., et al. "Microbiome Sharing between Children, Livestock and Household Surfaces in Western Kenya." *Plos One*, vol. 12, no. 2, 2017, pp. e0171017.

"The Bulk of the American Diet is 'Ultra-Processed' Food." *Grub Street*, 2016.