# Factors Influencing Gastrointestinal Microbiota during Pregnancy

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## INTRODUCTION

- Pregnancy is a period characterized by changes in the maternal hormonal and metabolic systems necessary to maintain the pregnancy and meet the demands of the developing fetus.[1]
- Inadequate physiologic adjustments can lead to adverse pregnancy outcomes that have implications for the short- and long-term health of the mother and the baby.[2-6]
- The gastrointestinal (GI) microbiota is increasingly studied to be involved in maintaining physiologic homeostasis.[7,8]

## PURPOSE

- To **present the state of the current evidence related to factors that are associated** with the structure, and subsequently function
- To **suggest the use of GI microbiota as a therapeutic target** to improve pregnancy outcomes.

## GASTROINTESTINAL (GI) MICROBIOTA

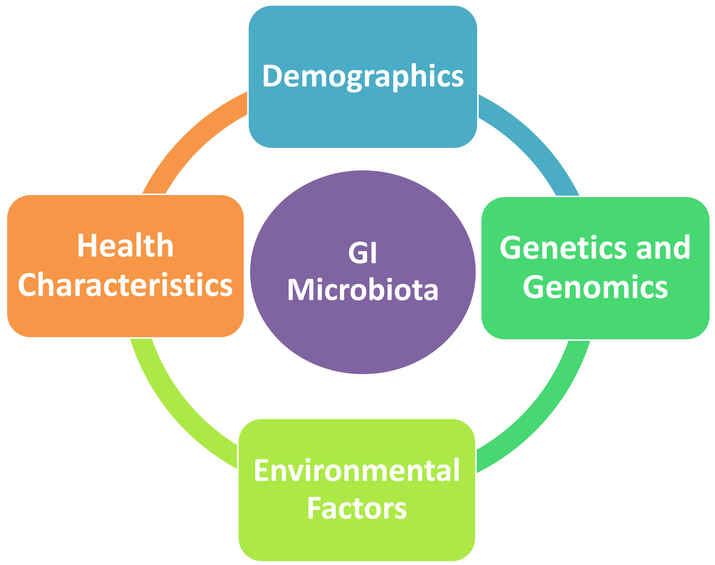
**GI Microbiota**

- 100 trillions of microbes, rich and diverse.[9-11]
- Regulate inflammatory pathways, glucose metabolism, insulin resistance, adiposity.[12,13]
- Contribute to synthesizing vitamins and antioxidants.[14–17]

**GI Microbiota during Pregnancy**

- Functions of GI microbiota are relevant to pregnancy outcomes.[2-4]
- Microbial composition shift from one that is similar to normal adults to those found in patients with metabolic syndrome.[18-20]
- Alpha-diversity drops, Beta-diversity increases.[19]

## FACTORS INFLUENCING GI MICROBIOTA




**Demographics**

- ***Age***: Alpha-diversity is "n" shaped-- high in adulthood and low in childhood and old age. Beta-diversity is "u" shaped.[14,21]
- ***Race/Ethnicity***: Microbial distribution differs across Asian, Black, Mexican, Puerto Rican, and White in U.S.[22-24]
- ***Geographical location***: Microbial composition differs across adults in Columbia, Venezuela and Malawi, U.S., Europe, and Asia.[14,23,25,26]

**Health Characteristics**

- ***Diet***: Fat in maternal diet prior to and during pregnancy modulates microbial structure, to one that favors lipid and glucose metabolism.[15]
- ***BMI***: Alters diversity and relative abundance of specific types of microbiota.[27-29] Pre-pregnancy BMI correlates with differences in density.[18]
- ***Dietary supplements***: Probiotics and $Fe_3$ supplementation changes the microbial composition to one that is more pathogenic.[30-32]
- ***Antibiotic use***: Type and duration are associated with decreased diversity.[33–38]

**Genetics and Genomics**

- Monozygotic twins have similar GI microbial composition compared to dizygotic twins.[39]

**Environmental Factors**

- Microbiota coat all organic and inorganic surfaces (e.g. indoors/outdoors environments and animals/pets).[40,41]

## FUTURE IMPLICATIONS

**Clinical**

- Understand the implications that GI microbiota has for disease and wellness to clinically address them
- Consider factors that can adversely influence GI microbiota when taking care of pregnant women
- Pursue opportunities to learn more about structure and function of GI microbiota

**Research**

- Use multi-omics approach to study the functions of GI microbiota
- Collaborate across disciplines
- Use larger cohort study to increase power
- Cautiously implement interventions

**Education**

- Incorporate information regarding implications of human genome and human microbiome on human health to nursing curriculum

## GLOSSARY

- **Microbiota:** Micro-organisms, such as bacteria, virus, fungi, archaea, protozoa. Majority of microbiota found on human body is bacteria
- **Microbiome:** Collective microbiota from different parts of the body or collective genome of microbiota (microbial genes)
- **Composition of GI microbiota:** Types of microbiota that comprise a fecal sample
- **Diversity of GI microbiota:** Abundance and proportionality of different types of microbiota
  - **Alpha-diversity:** within sample or subjects
  - **Beta-diversity:** between sample or subjects

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