



Microbiome Research and the Myth of Ethno-racial Categories

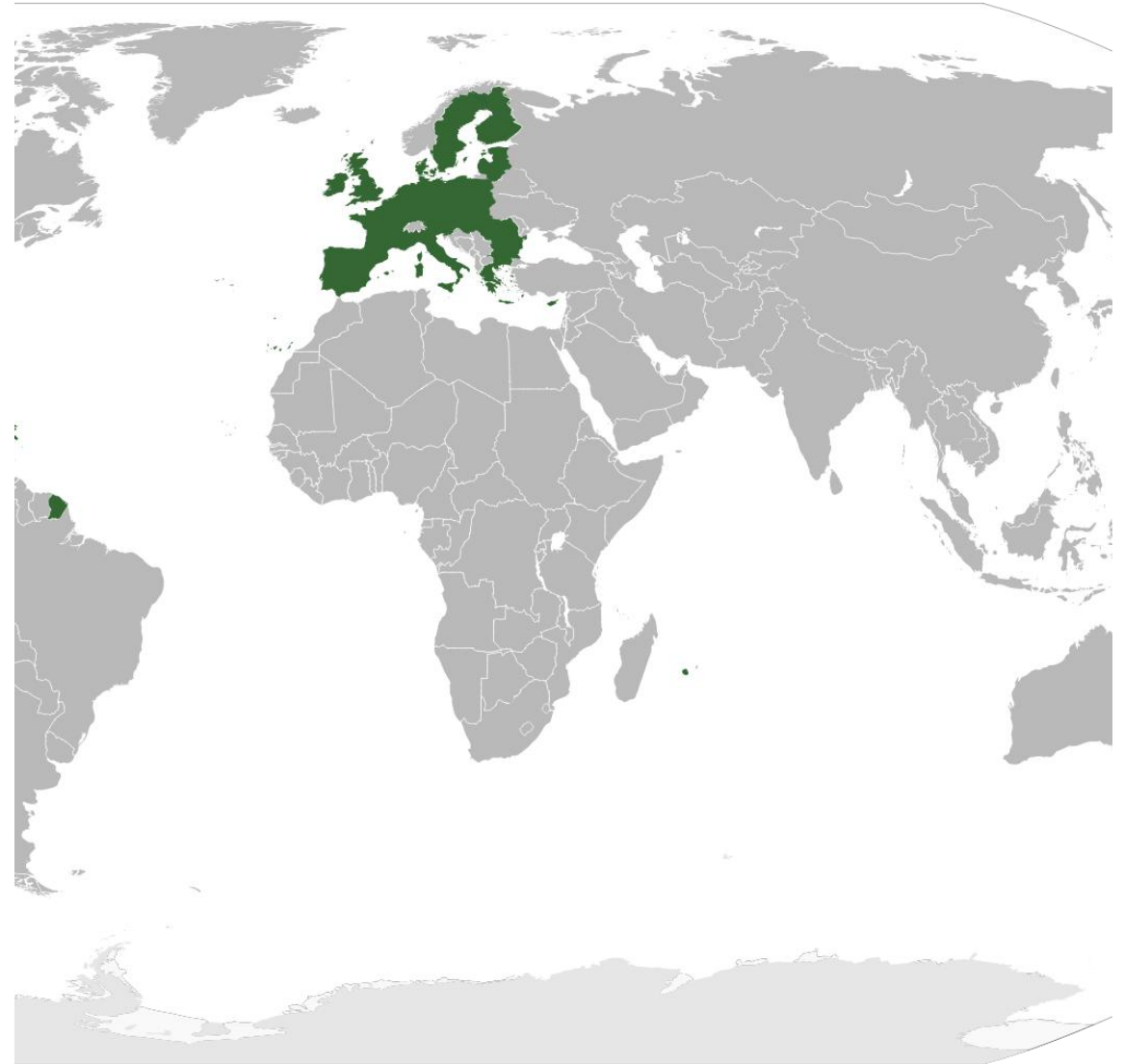
Aline Potiron, PSF 2025



Utrecht
University

Positionality Statement

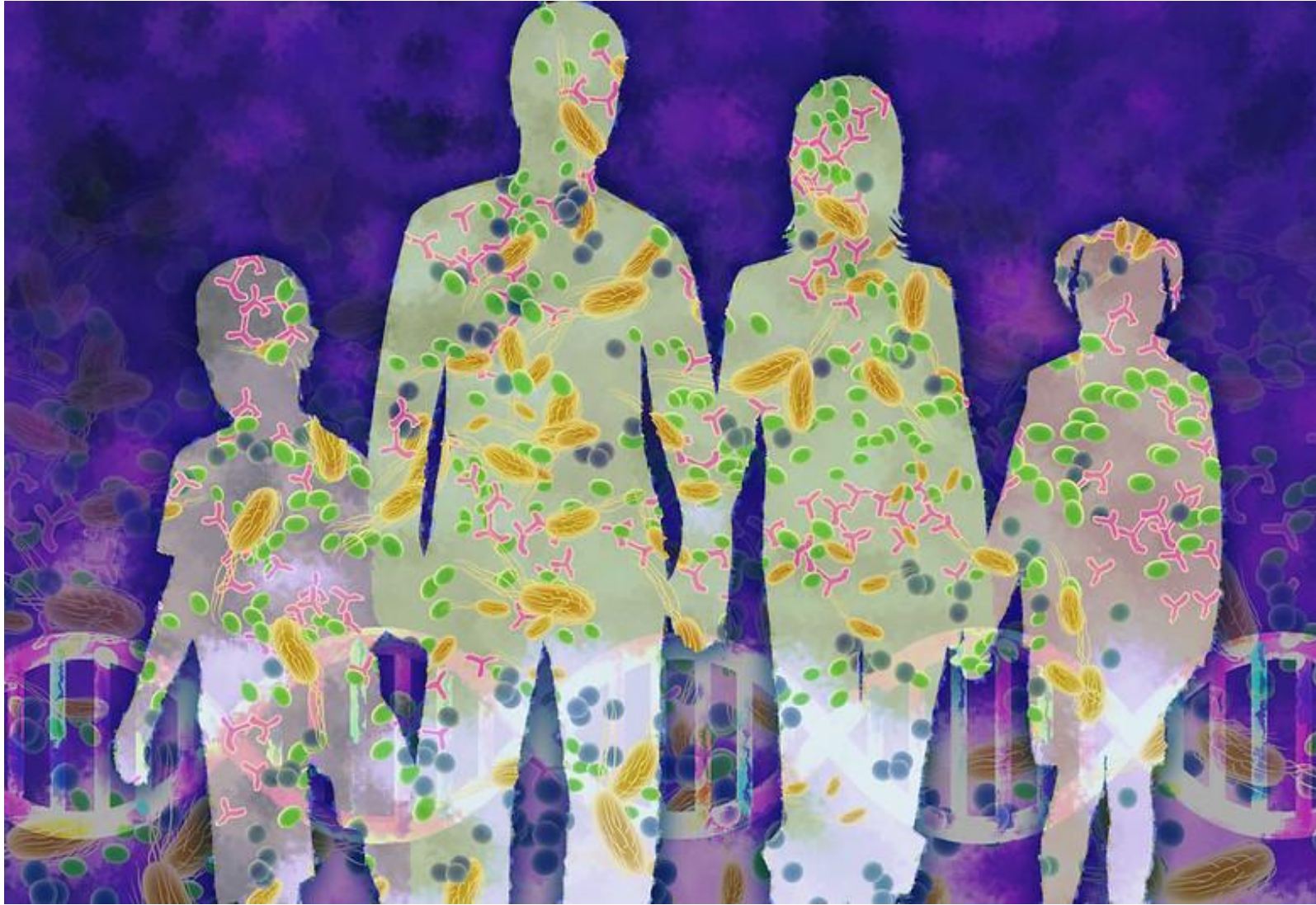
- Positionality: an individual's worldview and the stance they take in relation to research and its context (Holmes, 2020).
- **White European woman who spent most of her professional life in Europe.**
- **Biases:**
 - My vision and definition of race.
 - My racial experiences are also biased, as I am part of one of the most privileged populations.



A scanning electron micrograph (SEM) showing numerous green, rod-shaped bacteria. The bacteria are elongated and have a textured surface, appearing to be covered in fine ridges or grooves. They are scattered across the frame, with some showing signs of division or budding. The background is dark and granular.

Introduction

Image by [Gerd Altmann](#) from [Pixabay](#)



Microbiomes

Human Categorizations in Microbiomes

- Microbiome research uses **human categorizations**, including ethno-racial categories.
- **Civilizational ghosts** (Nieves-Delgado and Baedke, 2021; for a review, see Rawson 2024).
- **Microbiomization** (Helmreich 2014).



My contribution



- Microbiome studies **from 2018**, where ethno-racial categories are used to study human health disparities to inform **personalized medicine**.
- I question **the inferential power** of ethno-racial categories in this context.

My contribution



1. The definitions of ethno-racial categories are imprecise, creating **epistemic uncertainty**.
2. These categories **reduce multiple dimensions** into one category, which can result in **stereotyping and essentializing ethno-racial categories through the microbiome**.
3. The **instability of these categories** makes them useless for treating a particular individual.

Conclusion: Using ethno-racial categories in microbiome studies in the context of personalized medicine is **problematic and should be abandoned**.



1. Conceptual Imprecision

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Conceptual Imprecision

- Ethno-racial categories are ambiguous and inconsistent, creating **epistemic uncertainty** (Malinowska and Serpico, 2023).
- This **conceptual imprecision also plagues microbiome studies.**
- **Method** (ongoing): non-systematic review in PubMed, EuroPMC, and Web of Science – terms “ethnicity”, “race” in Title and Abstracts associated with “human gut microbiome”

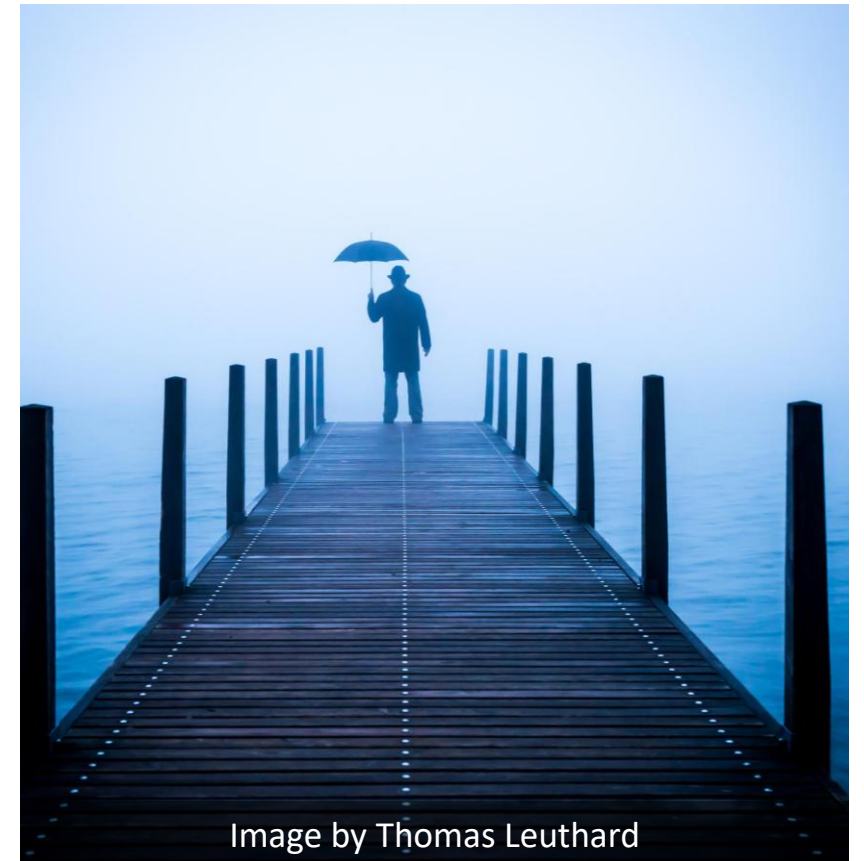


Image by Thomas Leuthard

Conceptual Imprecision

Articles	Terms employed	Define (not explicitly) as
Amato et al. (2021)	Race and ethnicity	“Structurally imposed differences in lifestyle and environmental factors”, often associated with ancestry
Borello et al. (2022)	Race and ethnicity	Proxy for diet
Brooks et al. (2018)	Ethnicity	Self-declared, aspects of human genetic variation, social, economic and cultural variations
Deschasaux et al. (2018)	Ethnicity	HELIUS definition, people with same “diet, lifestyle, or genetics”, Western and non-Western
Gaulke and Sharpton (2018)	Ethnicity	Genetic diversity, geography
Syromyatnikov et al. (2022)	Race and ethnicity	Genetic diversity, living conditions, nationalities, and religions

Conceptual Imprecision

01

Studies often **use interchangeably different concepts** such as “race,” “ethnicity,” “geography,” and “nationality.”

02

Few studies **define** these terms before using them, or **do not use them consistently** throughout one paper.

03

When institutional or more general definitions backed up such papers, those **definitions are not consistent globally and depend mainly on the location of the researchers.**

04

This situation prevents **comparative analyses** of different studies and **hinders scientific communication.**



Conceptual Imprecision

- Researcher's **personal conceptualization** (Malinowska and Serpico 2023):
 - Ability to **distinguish** between concepts such as “race”, “ethnicity”, and “ancestry”.
 - The **theoretical assumptions** embedded in such terms.
 - Personal beliefs and assumptions.

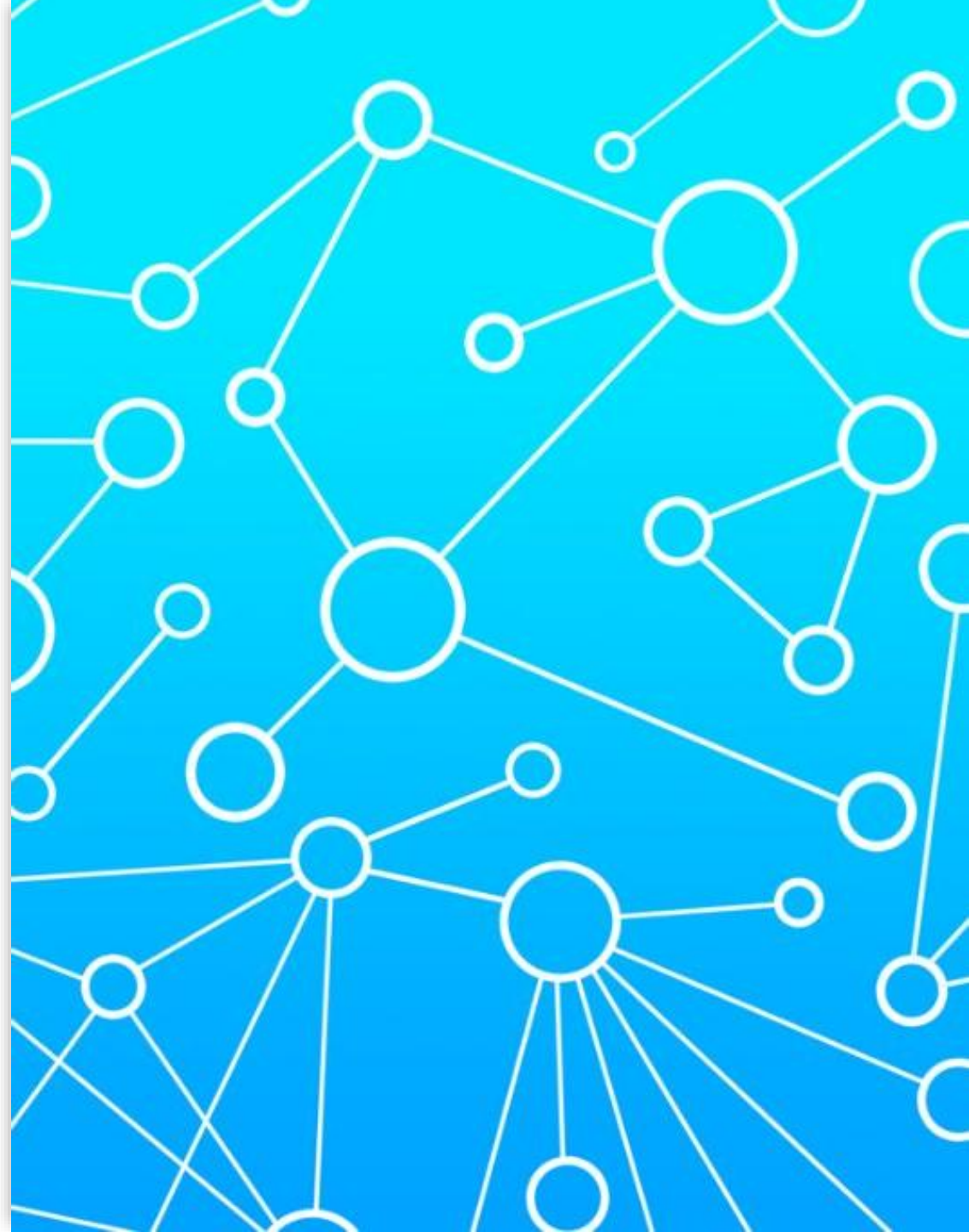


2. Reduction of Multiple Dimensions

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Reduction of Multiple Dimensions

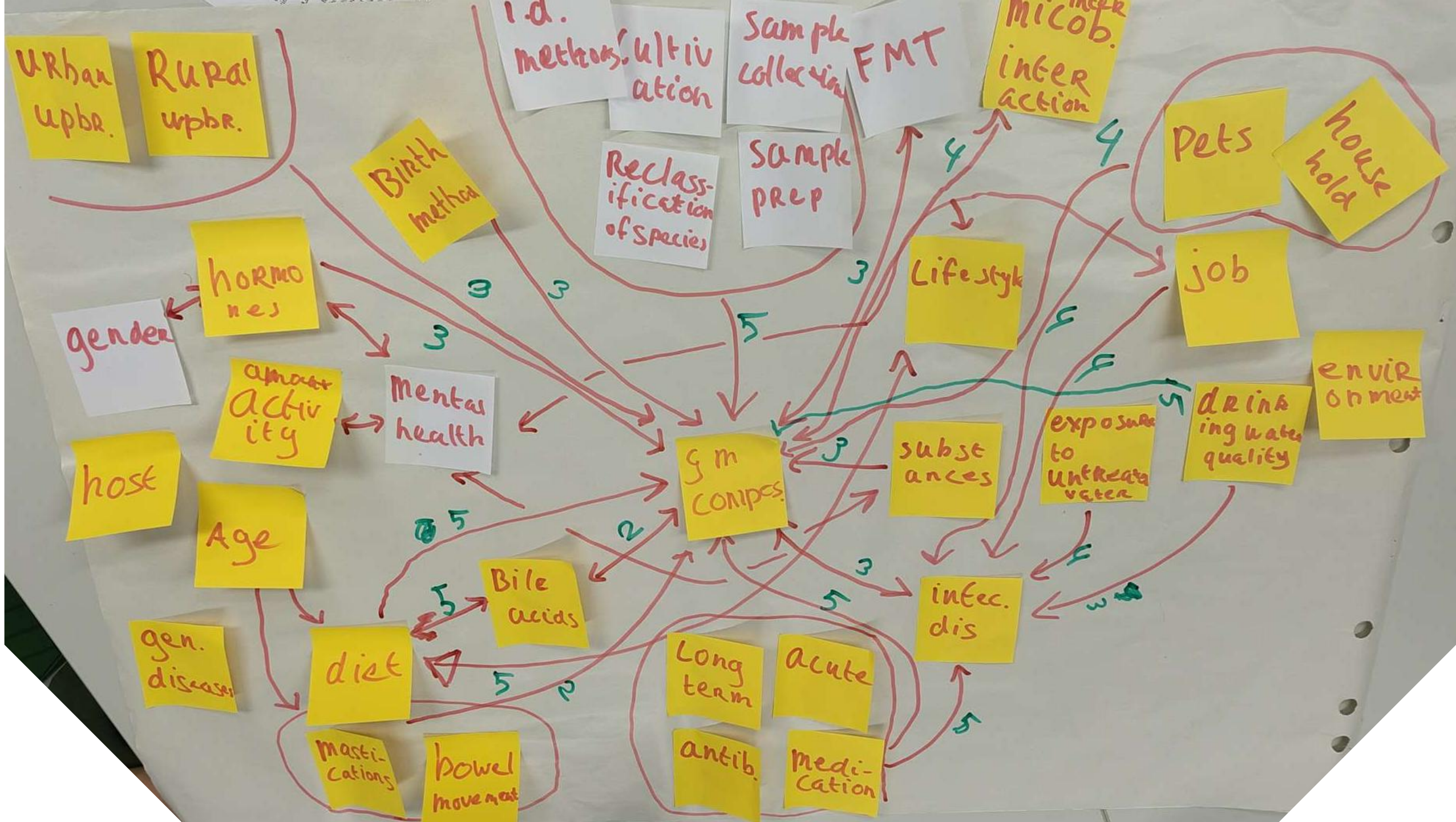
- Ethno-racial categories **reduce multiple dimensions**, including human genetic diversity, diet, and socio-cultural dimensions, into one category.
- **Method** (ongoing):
 - Three focus groups of scientists based in Germany, specializing in microbiome studies.
 - Causal Network (**Fuzzy Cognitive Maps**)





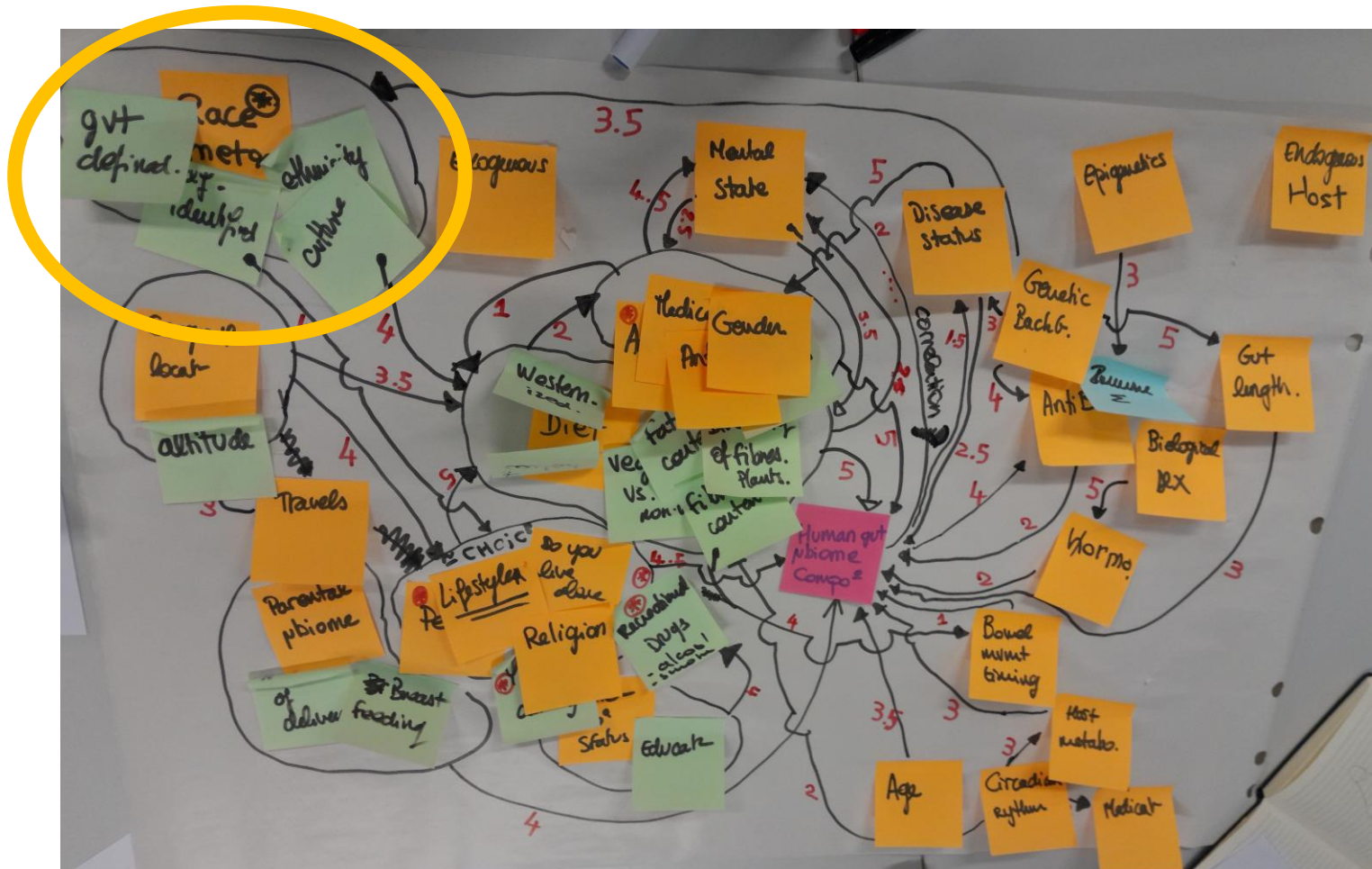
Reduction of Multiple Dimensions

*“Based on **your knowledge and personal experience**, which factors **influence** the human gut microbiome composition? ”*



Reduction of Multiple Dimension

“Based on your knowledge and personal experience, which factors influence the human gut microbiome composition?”



Reduction of Multiple Dimensions

- “Race”: An **umbrella term** for government-decided (social constraint/driver), self-identification, culture, and ethnicity.
- “Race” is exogenous, BUT causally connected to genetic background, which is endogenous.
- **Only “subterms” remain:** culture is causally connected to diet, and self-identification is causally connected to lifestyle.

⇒ **Unclear variables of interest.**

- Confusion in cause-effect relationships:
Uncertainty about the causal role (if any) of the racial category



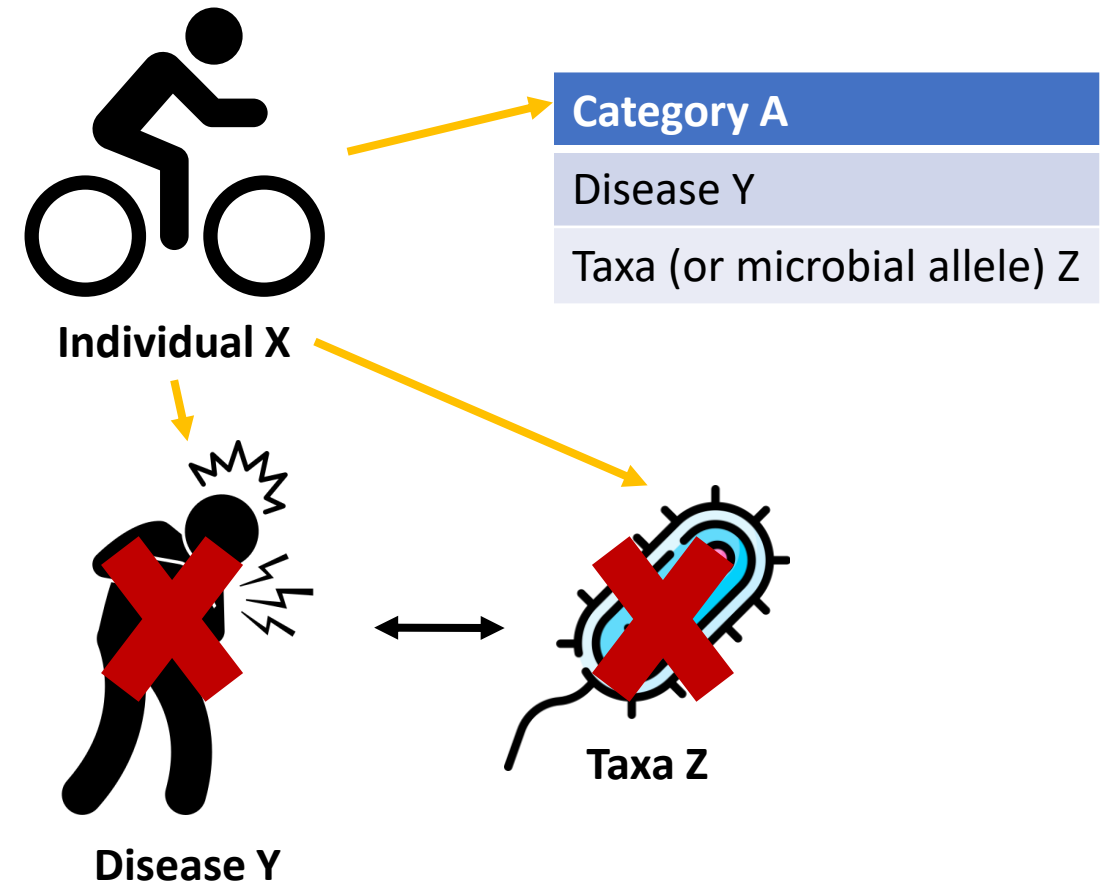
3. Heuristic Limits of Ethno-racial Categories

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Heuristic Limits of Ethno-racial Categories

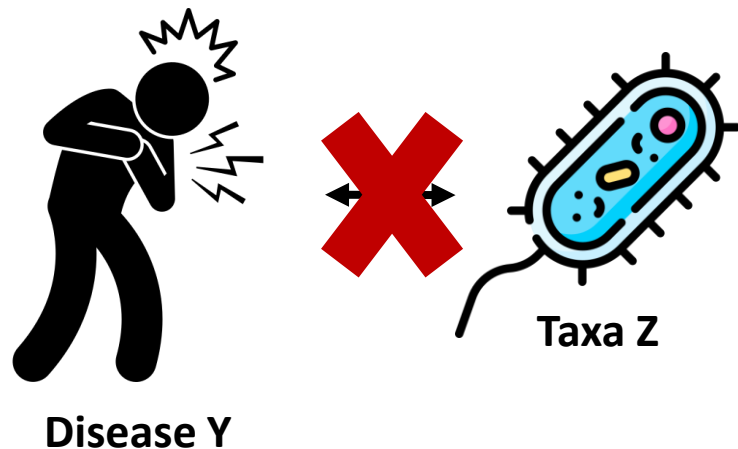
- Ethno-racial categories help make inferences:
- *Which disease will they be susceptible to?*
- *How to treat them?*
- *Etc.*



Heuristic Limits of Ethno-racial Categories

- Few studies have found **consistent, reliable associations between microbial taxa and disease or health phenotypes.**

Category A
Disease Y
Taxa (or microbial allele) Z



- What is category A? How is ethnicity/race understood?

Heuristic Limits of Ethno-racial Categories

HUMAN GENETIC DIVERSITY

“Ethno-racial groups cannot be expected to be homogeneous for every biological and environmental factor that is relevant to a given pathological phenotype” (Malinowska and Serpico, 2023)

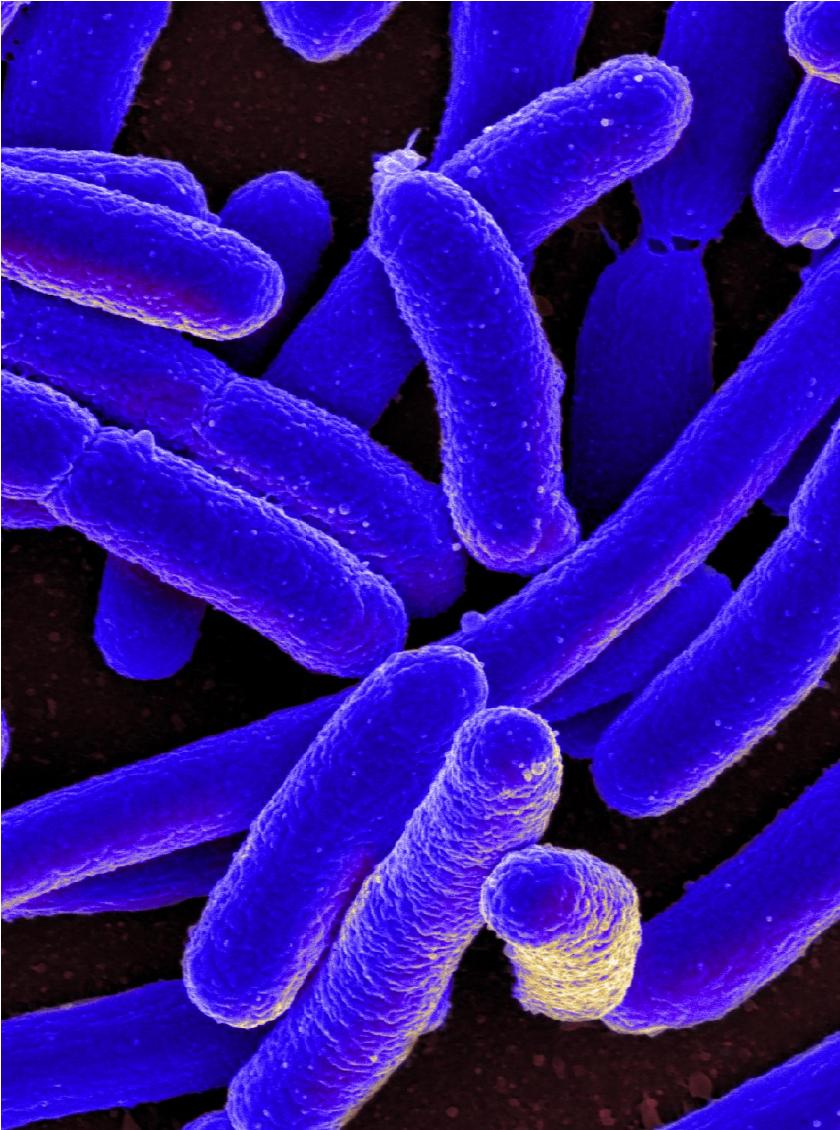
No microbial taxa (or alleles) are reliably and consistently associated with a particular **human allele**.

DIET/LIFESTYLE

Some associations between nutrients (e.g., glucose) and certain diseases (e.g., obesity).

Some associations between nutrients (e.g., fibers) and certain microbial functions (e.g., SCFAs production).

OTHER?



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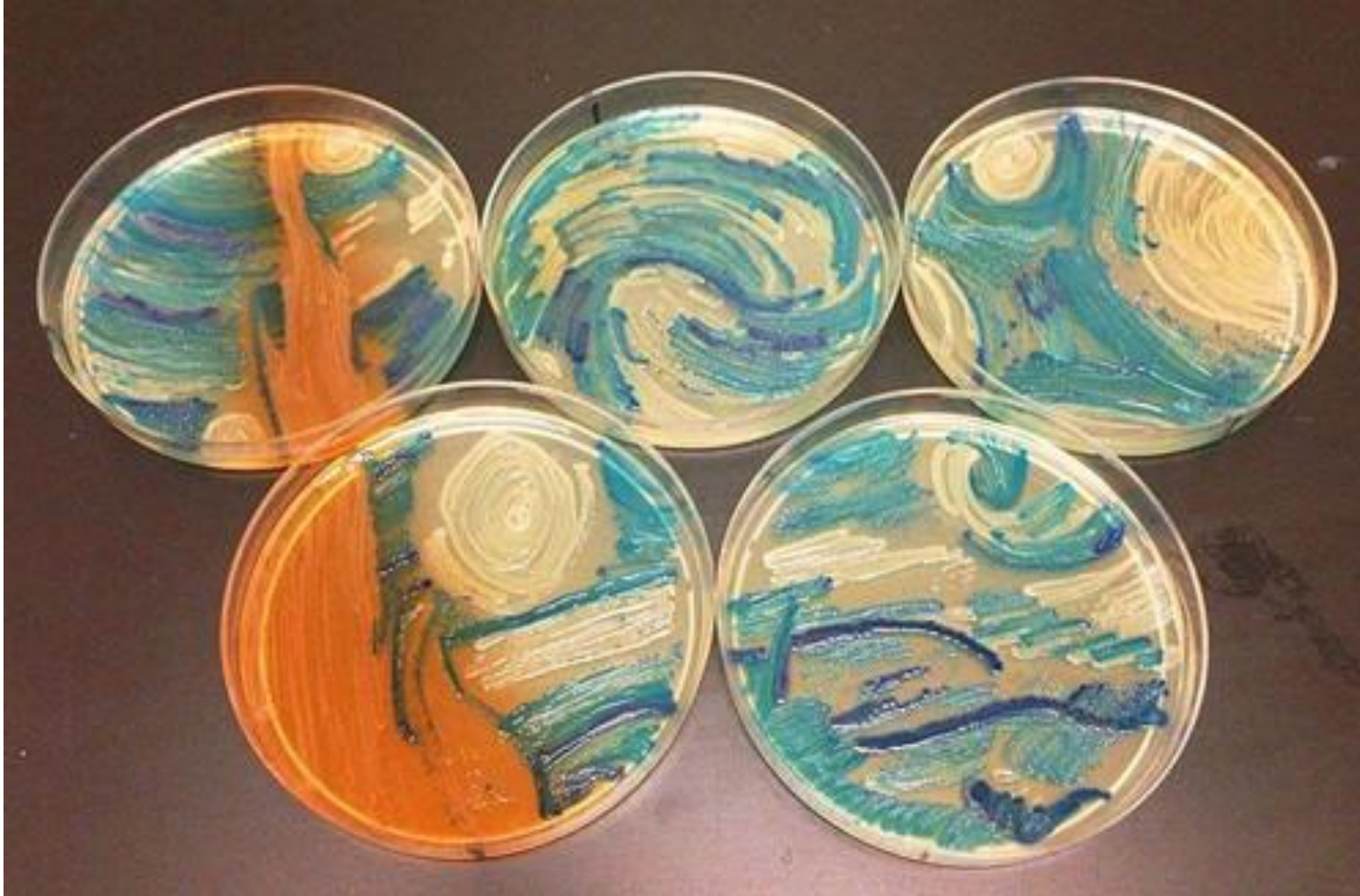
Heuristic Limits of Ethno-racial Categories

- Even if stable associations were found, these factors could lead **to different classifications of the same human population**, not necessarily consistent with more classical (US-centered) definitions of race, nor consistent between diseases.
- Thus, ethno-racial categories **are useless for treating a particular individual**.

Conclusion

- Ethno-racial categories in microbiome **studies have limited inferential power.**
- The risks of using ethno-racial categories in microbiome studies, including **poor scientific communication**, attributing **a spurious causal role** to these categories, **stereotyping**, and **misplacing individuals** into categories that may not be relevant for treatment or risk-factor assessment, **outweigh any potential benefits.**
- Instead, researchers should focus on the **actual variables** they are interested in, such as diet, to avoid racist descriptions and the microbiomization of ethno-racial categories.





Thank you!

Vincent van Gogh's "The Starry Night" by Melanie Sullivan of Missouri. *American Society of Microbiology.*