GMIA R21 Phase Statistical Analysis Plan

Alex Carlson

September 28, 2018

Inclusion Criteria:

Study: Full term, vaginal delivery, exclusively breastfed to first visit

Microbiome: providing adequate fecal samples at 0 or 1 years

MRI: useable brain volumes at either 0 or 1 years

Behavior: useable video at 1 year

Exclusion Criteria:

Study: Antibiotics to first visit, NICU time

MRI: incidental pathological findings at either 0 or 1

Subjects in Total: 35

MA001, MA004, MA006, MA007, MA008, MA011, MA012, MA013, MA014, MA015, MA016, MA018, MA019, MA020, MA021, MA022, MA023, MA024, MA025, MA026, MA027, MA028, MA029, MA030, MA032, MA033, MA036, MA037, MA038, MA039, MA040, MA043, MA044, MA045, MA046

Subjects with useable neo microbiome: 33

MA001.NEO, MA004.NEO, MA006.NEO, MA007.NEO, MA008.NEO, MA011.NEO, MA012.NEO, MA013.NEO, MA014.NEO, MA015.NEO, MA016.NEO, MA020.NEO, MA021.NEO, MA022.NEO, MA023.NEO, MA024.NEO, MA025.NEO, MA026.NEO, MA027.NEO, MA028.NEO, MA029.NEO, MA030.NEO, MA032.NEO, MA033.NEO, MA036.NEO, MA037.NEO, MA038.NEO, MA039.NEO, MA040.NEO, MA043.NEO, MA044.NEO, MA045.NEO, MA046.NEO

Subjects with useable 1yr microbiome: 21

MA001.1yr, MA004.1yr, MA006.1yr, MA007.1yr, MA008.1yr, MA012.1yr, MA014.1yr, MA016.1yr, MA018.1yr, MA019.1yr, MA020.1yr, MA022.1yr, MA023.1yr, MA024.1yr, MA025.1yr, MA026.1yr, MA027.1yr, MA028.1yr, MA029.1yr, MA030.1yr, MA032.1yr, MA036.1yr

Subjects with longitudinal microbiome: 18

MA001, MA004, MA006, MA007, MA008, MA012, MA014, MA020, MA022, MA023, MA024, MA025, MA026, MA027, MA028, MA029, MA030, MA032, MA036

Subjects with useable neo brain volumes: 29

MA004, MA006, MA007, MA008, MA011, MA012, MA013, MA014, MA016, MA019, MA020, MA021, MA022, MA023, MA024, MA025, MA026, MA027, MA028, MA029, MA032, MA033, MA036, MA037, MA038, MA039, MA043, MA044, MA045

Subjects with useable 1yr brain volumes: 16

MA001, MA004, MA006, MA008, MA012, MA016, MA019, MA020, MA021, MA022, MA025, MA026, MA028, MA029, MA033, MA036

Subjects with useable mask behavior: 20

MA001, MA006, MA007, MA008, MA012, MA013, MA014, MA016, MA019, MA023, MA024, MA026, MA029, MA030, MA032, MA036, MA037, MA038, MA039, MA045

Subjects with useable strange situation behavior: 31

MA001, MA004, MA006, MA007, MA008, MA012, MA013, MA014, MA016, MA018, MA019, MA020, MA021, MA022, MA023, MA024, MA025, MA026, MA027, MA028, MA029, MA030, MA032, MA036, MA037, MA038, MA039, MA043, MA044, MA045, MA046

Predictors: Neonate Alpha Diversity (Shannon, pd.whole, chao1, observed species), 1yr Alpha Diversity (Shannon, pd.whole, chao1, observed species), Neonate Beta Diversity (Weighted Unifrac PC1 and PC2), 1yr Beta Diversity (Weighted Unifrac PC1 and PC2)

Outcomes: Neonate Brain Volumes, 1yr Brain Volumes, Mask Task, Strange Situation, IBQ-R

1. **Neonate Alpha Diversity/Beta Diversity Covariate Identification**

Predictor:

categorical: income.code, maternalpsych, sex, METHNIC, PETHNIC, older.sibling, prepregBMI, maternalinfection, vitamindneo

continuous: gestagebirth, BW, MAGE, MEDUY, PAGE, PEDUY, AGEVISITNEO

Outcome:

alpha diversity indices (Pd.whole, Shannon, observed.species, chao1),

beta diversity (weighted Unifrac PC 1, PC2, PC3)

# of subjects: 33

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue
* Qvalue

1. **1yr Alpha Diversity/Beta Diversity Covariate Identification**

Predictor:

categorical:

income.code, OLDERSIBLINGS, SEX, MaternalInfection, MPSYCH, VITAMINDNEO, PrePregBMI, Antibiotic\_1yr, FEVER\_1yr, DAYCARE, CURBRFEED\_1yr, FORMULA\_1yr, MILKS\_1yr, FrenchFries\_1yr, SweetFoodsDrinks\_1yr, PeanutButter\_1yr, FORMULA\_6mo, VITAMIND\_6mo, Cereals\_6mo

continuous:

AgeAt1yrVisit, MAGE, PAGE, MEDUY, PEDUY, WHSTOTHER,

Outcome:

alpha diversity indices (Pd.whole, Shannon, observed.species, chao1)

beta diversity (weighted Unifrac PC 1, PC2)

# of subjects: 21

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue
* Qvalue

1. **Neonatal Alpha Diversity - Neonatal PICRUSt**

Predictor: **neonatal** alpha diversity (Pd.whole, Shannon, observed.species, chao1)

Outcome: **neonatal** PICRUSt KEGG output (L1, L2, L3)

# of subjects: 33

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **Neonatal Beta Diversity - Neonatal PICRUSt**

Predictor: **neonatal** beta diversity (Weighted Unifrac PC1 and PC2)

Outcome: **neonatal** PICRUSt KEGG output (L1, L2, L3)

# of subjects: 33

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **1yr Alpha Diversity- 1yr PICRUSt**

Predictor: **1yr** alpha diversity (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** PICRUSt KEGG output (L1, L2, L3)

# of subjects: 21

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **1yr Beta Diversity - 1yr PICRUSt**

Predictor: **1yr** beta diversity (Weighted Unifrac PC1 and PC2)

Outcome: **1yr** PICRUSt KEGG output (L1, L2, L3)

# of subjects: 21

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **Neonatal Alpha Diversity – Neonatal Regional Grey Matter Volumes**

Predictor: **neonatal** alpha diversity indices (Pd.whole, Shannon, observed.species, chao1)

Outcome: **neonatal** imperial grey matter volumes (hippocampus\_LR, amygdala\_LR, mPFC)

# of subjects: 28

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **Neonatal Alpha Diversity – Neonatal Global Brain Volumes**

Predictor: **neonatal** alpha diversity indices (Pd.whole, Shannon, observed.species, chao1)

Outcome: **neonatal** global brain volumes (WM, GM, CSF, ICV)

# of subjects: 28

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **Neonatal Alpha Diversity – 1yr Regional Grey Matter Volumes**

Predictor: **neonatal** alpha diversity indices (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** imperial grey matter volumes (hippocampus\_LR, amygdala\_LR, mPFC)

# of subjects: 15

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **Neonatal Alpha Diversity – 1yr Global Brain Volumes**

Predictor: **neonatal** alpha diversity indices (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** global brain volumes (WM, GM, CSF, ICV)

# of subjects: 15

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **Neonatal Alpha Diversity – Mask Task Outcomes**

Predictor: **neonatal** alpha diversity indices (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** mask task behavior repeated measures model across masks (facial fear, vocal distress, bodily fear, startle response, escape behavior)

# of subjects: 19

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **Neonatal Alpha Diversity – Strange Situation Outcomes**

Predictor: **neonatal** alpha diversity indices (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** strange situation behavior repeated measures model across episodes 3.1,3.2,3.3

# of subjects: 29

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **Neonatal Alpha Diversity – Infant Behavior Questionnaire Fear Index**

Predictor: **neonatal** alpha diversity indices (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** IBQ-R Fear Score

# of subjects: 28

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **1yr Alpha Diversity – 1yr Regional Grey Matter Volumes**

Predictor: **1yr** alpha diversity indices (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** imperial grey matter volumes (hippocampus\_LR, amygdala\_LR, mPFC)

# of subjects: 13

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **1yr Alpha Diversity – 1yr Global Brain Volumes**

Predictor: **1yr** alpha diversity indices (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** global brain volumes (WM, GM, CSF, ICV)

# of subjects: 13

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **1yr Alpha Diversity – 1yr Mask Task Outcomes**

Predictor: **1yr** alpha diversity indices (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** mask task behavior repeated measures model across masks (facial fear, vocal distress, bodily fear, startle response, escape behavior)

# of subjects: 14

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **1yr Alpha Diversity – 1yr Strange Situation Outcomes**

Predictor: **1yr** alpha diversity indices (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** strange situation behavior repeated measures model across episodes 3.1,3.2,3.3

# of subjects: 21

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **1yr Alpha Diversity – Infant Behavior Questionnaire Fear Index**

Predictor: **1yr** alpha diversity indices (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** IBQ-R Fear Score

# of subjects: 20

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. Δ **Alpha Diversity – 1yr Regional Grey Matter Volumes**

Predictor: **Δ alpha diversity indices** from neo to 1yr (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** imperial grey matter volumes (hippocampus\_LR, amygdala\_LR, mPFC)

# of subjects: 12

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. Δ **Alpha Diversity – 1yr Global Brain Volumes**

Predictor: **Δ alpha diversity indices** from neo to 1yr (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** global brain volumes (WM, GM, CSF, ICV)

# of subjects: 12

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. Δ **Alpha Diversity – 1yr Mask Task Outcomes**

Predictor: Δalpha diversity indices from neo to 1yr (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** mask task behavior repeated measures model across masks (facial fear, vocal distress, bodily fear, startle response, escape behavior)

# of subjects: 13

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. Δ **Alpha Diversity – 1yr Strange Situation Outcomes**

Predictor: **Δ alpha diversity indices from neo to 1yr** (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** strange situation behavior repeated measures model across episodes 3.1,3.2,3.3

# of subjects: 19

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. Δ **Alpha Diversity – Infant Behavior Questionnaire Fear Index**

Predictor: **Δ alpha diversity indices from neo to 1yr** (Pd.whole, Shannon, observed.species, chao1)

Outcome: **1yr** IBQ-R Fear Score

# of subjects: 18

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **Neonatal Beta Diversity – Neonatal Regional Grey Matter Volumes**

Predictor: **neonatal** beta diversity (weighted Unifrac PC1, PC2)

Outcome: **neonatal** imperial grey matter volumes (hippocampus\_LR, amygdala\_LR, mPFC)

# of subjects: 28

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **Neonatal Beta Diversity – Neonatal Global Brain Volumes**

Predictor: **neonatal** beta diversity (weighted Unifrac PC1, PC2)

Outcome: **neonatal** global brain volumes (WM, GM, CSF, ICV)

# of subjects: 28

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **Neonatal Beta Diversity – 1yr Regional Grey Matter Volumes**

Predictor: **neonatal** beta diversity (weighted Unifrac PC1, PC2)

Outcome: **1yr** imperial grey matter volumes (hippocampus\_LR, amygdala\_LR, mPFC)

# of subjects: 15

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **Neonatal Beta Diversity – 1yr Global Brain Volumes**

Predictor: **neonatal** beta diversity (weighted Unifrac PC1, PC2)

Outcome: **1yr** global brain volumes (WM, GM, CSF, ICV)

# of subjects: 15

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **Neonatal Beta Diversity – Mask Task Outcomes**

Predictor: **neonatal** beta diversity (weighted Unifrac PC1, PC2)

Outcome: **1yr** mask task behavior repeated measures model across masks (facial fear, vocal distress, bodily fear, startle response, escape behavior)

# of subjects: 19

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **Neonatal Beta Diversity – Strange Situation Outcomes**

Predictor: **neonatal** beta diversity (weighted Unifrac PC1, PC2)

Outcome: **1yr** strange situation behavior repeated measures model across episodes 3.1,3.2,3.3

# of subjects: 29

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **Neonatal Beta Diversity – Infant Behavior Questionnaire Fear Index**

Predictor: **neo** beta diversity (weighted Unifrac PC1, PC2)

Outcome: **1yr** IBQ-R Fear Score

# of subjects: 28

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **1yr Beta Diversity – 1yr Regional Grey Matter Volumes**

Predictor: **1yr** beta diversity (weighted Unifrac – PC1, PC2)

Outcome: **1yr** imperial grey matter volumes (hippocampus\_LR, amygdala\_LR, mPFC)

# of subjects: 13

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **1yr Beta Diversity – 1yr Global Brain Volumes**

Predictor: **1yr** beta diversity (weighted Unifrac – PC1, PC2)

Outcome: **1yr** global brain volumes (GM, WM, CSF, ICV)

# of subjects: 13

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **1yr Beta Diversity – 1yr Mask Task Outcomes**

Predictor: **1yr** beta diversity (weighted Unifrac PC1, PC2)

Outcome: **1yr** mask task behavior repeated measures model across masks (facial fear, vocal distress, bodily fear, startle response, escape behavior)

# of subjects: 14

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **1yr Beta Diversity – 1yr Strange Situation Outcomes**

Predictor: **1yr** beta diversity (weighted Unifrac PC1, PC2)

Outcome: **1yr** strange situation behavior repeated measures model across episodes 3.1,3.2,3.3

# of subjects: 21

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue

1. **1yr Beta Diversity – Infant Behavior Questionnaire Fear Index**

Predictor: **1yr** beta diversity (weighted Unifrac PC1, PC2)

Outcome: **1yr** IBQ-R Fear Score

# of subjects: 20

Predictor Covariates: none

Outcome Covariates: none

Output:

* Estimate
* Pvalue