



## INTRODUCTION

- Fetal growth restriction (FGR) is a common pregnancy complication and remains one of the primary contributors to perinatal mortality, as well as short- and long-term morbidity.
- There are currently no effective treatments for placental dysfunction, and the focus of care remains enhanced fetal surveillance and delivery based on absolute and relative indications.
- It is unknown whether postnatal catch-up growth in infants affected by late-onset FGR mitigates against any adverse prenatal impact on brain development.
- Establishing the relative importance of pre- and post-natal influences on neurodevelopmental outcomes is of critical importance for the optimization of perinatal management in the setting of late-onset FGR.

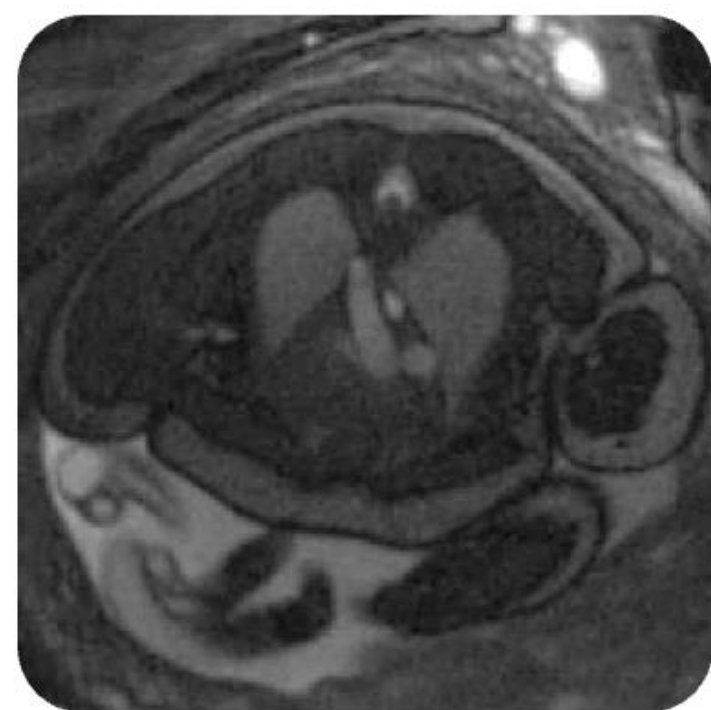
## METHODS

- Prospective observational cohort study** at Mount Sinai Hospital and The Hospital for Sick Children, Toronto, Canada



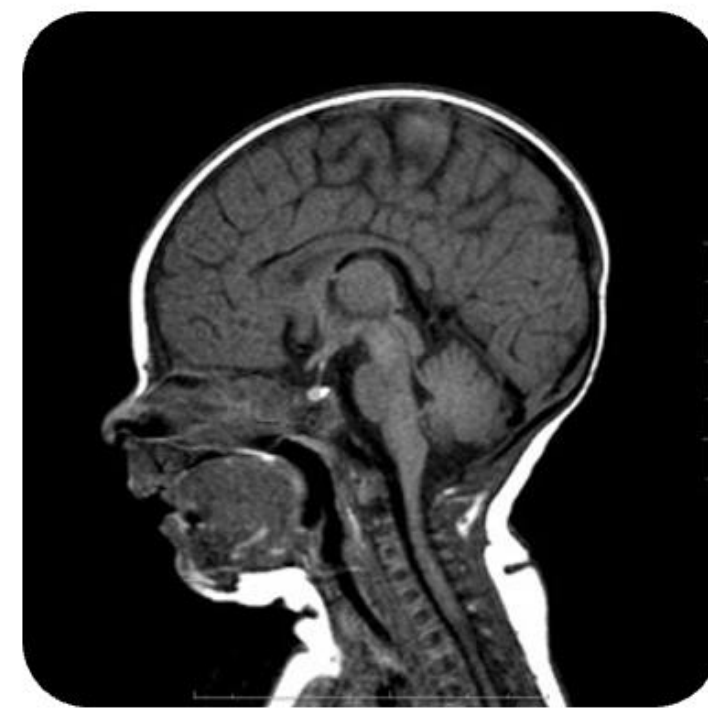
### Recruitment

- Antenatal clinic
- ≥ 32 gestational weeks
- <25 centile EFW
- Expectation some will develop **late-onset FGR**



### Fetal CMR

- Major fetal vessels
- Blood flow**
- Oximetry**
- Fetal body and brain volume



### Neonatal Brain MRI

- Brain volume**
- White matter maturation**
- Cerebral metabolites**



### Neurodevelopment Follow-up

- Alberta Infant Motor Scale** at 4, 8, 12 months
- Bayley Scales for Infant and Toddler Development 3<sup>rd</sup> Ed.** at 18, 36 months
- Somatic growth**

## RESULTS

- Fetal oxygen delivery and consumption were associated with raw fetal weight and Z-score
- Fetal and cerebral oxygen delivery, as well as CPR and UA-PI (inverse) were associated with fetal brain weight
- No significant associations between MCA-PI or fetal cerebral to pulmonary ratio with fetal brain weight.
- UA-PI raw and Z-score were inversely associated with 18-month Bayley motor composite score
- Fetal cerebral blood flow and oxygen delivery, as well as CPR and MCA-PI raw and Z-score were not associated with neurodevelopmental outcomes

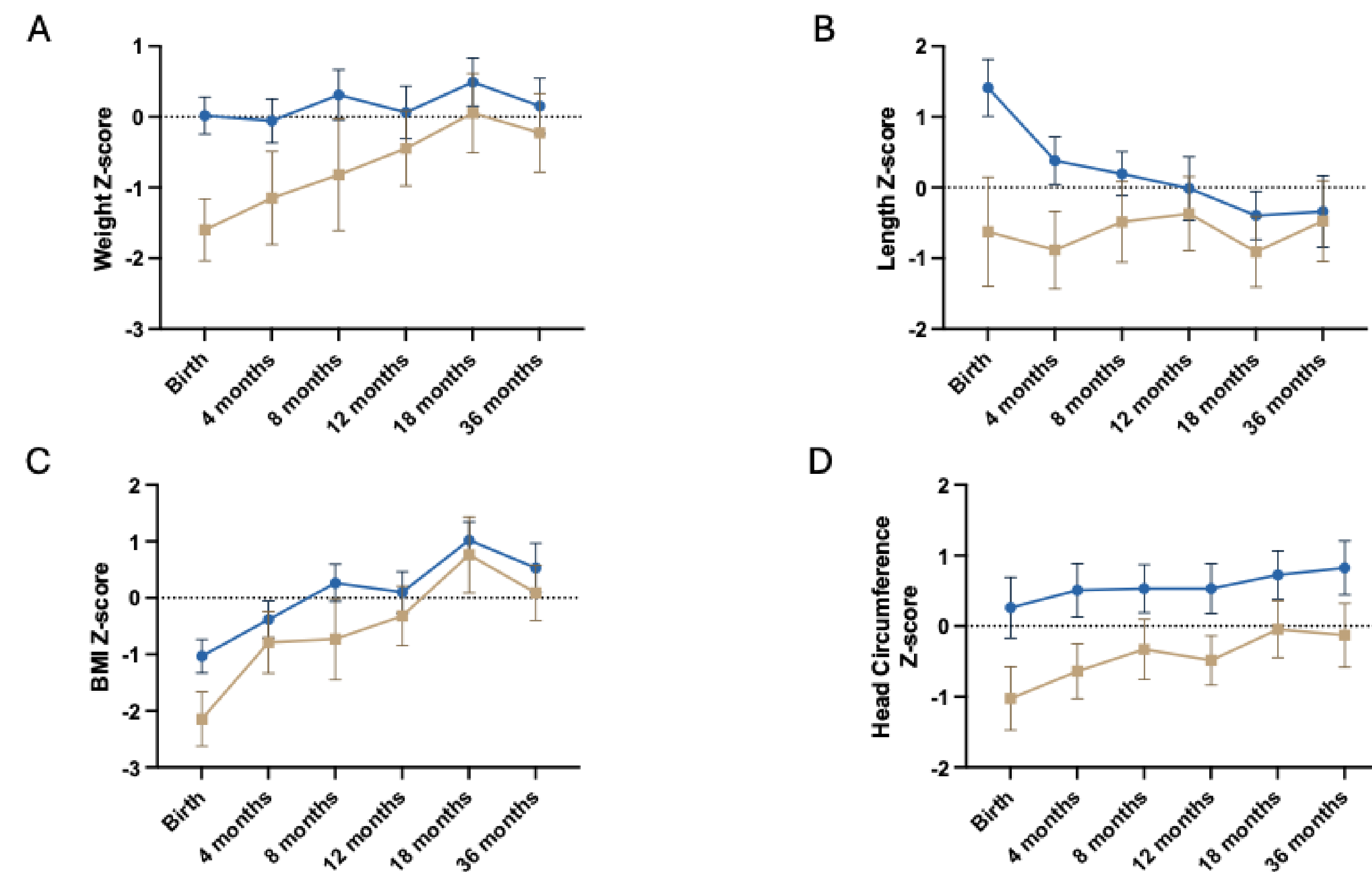


Figure 1. Somatic growth trajectories of term infants with and without late-onset FGR. Each time point is represented as mean 95% CI.

|                            | n  | AGA          | n  | Term FGR     | Mean difference (95% CI) | P value |
|----------------------------|----|--------------|----|--------------|--------------------------|---------|
| <b>4 month AIMS</b>        |    |              |    |              |                          |         |
| Total score                | 34 | 16.1 (4.6)   | 14 | 14.8 (2.2)   | -1.3 (-3.8 to 1.2)       | 0.31    |
| <b>8 month AIMS</b>        |    |              |    |              |                          |         |
| Total score                | 33 | 39.2 (8.2)   | 12 | 36.3 (11.8)  | -2.99 (-9.2 to 3.3)      | 0.34    |
| <b>12 month AIMS</b>       |    |              |    |              |                          |         |
| Total score                | 28 | 53.7 (4.9)   | 14 | 49.1 (8.5)   | -4.5 (-8.6 to -0.3)      | 0.03    |
| <b>18 month BSID-III</b>   |    |              |    |              |                          |         |
| Cognitive Composite Scores | 31 | 107.1 (13.1) | 15 | 100.7 (13.6) | -6.4 (-14.8 to 1.9)      | 0.12    |
| Language Composite Scores  | 31 | 108 (18.4)   | 15 | 96.6 (25.6)  | -11.3 (-24.6 to 1.8)     | 0.09    |
| Motor Composite Scores     | 30 | 104.5 (9.9)  | 15 | 101.1 (14.5) | -3.3 (-10.6 to 3.9)      | 0.36    |
| <b>36 month BSID-III</b>   |    |              |    |              |                          |         |
| Cognitive Composite Scores | 25 | 104.8 (9)    | 14 | 102.9 (11.9) | -1.9 (-8.7 to 4.8)       | 0.56    |
| Language Composite Scores  | 22 | 113.2 (11.2) | 13 | 106.9 (13.7) | -6.3 (-14.9 to 2.3)      | 0.14    |

## CONCLUSIONS

- Fetal CMR** may have an adjunct role in **delivery planning** for late-onset FGR based on the severity of **circulatory centralization of blood flow** favouring the brain and heart
- Term infants exposed to late-onset FGR demonstrated **perinatal brain growth and maturation similar** to newborns born AGA
- Term infants exposed to late-onset FGR exhibited **catch up growth** similar to newborns born AGA by **12 months** of age, but **HC** is consistently **smaller** until **36 months** of age
- Early neurodevelopmental outcomes similar** to newborns born AGA
- Longer gestation** was associated with **improved neurodevelopmental outcomes**

## ACKNOWLEDGEMENTS

