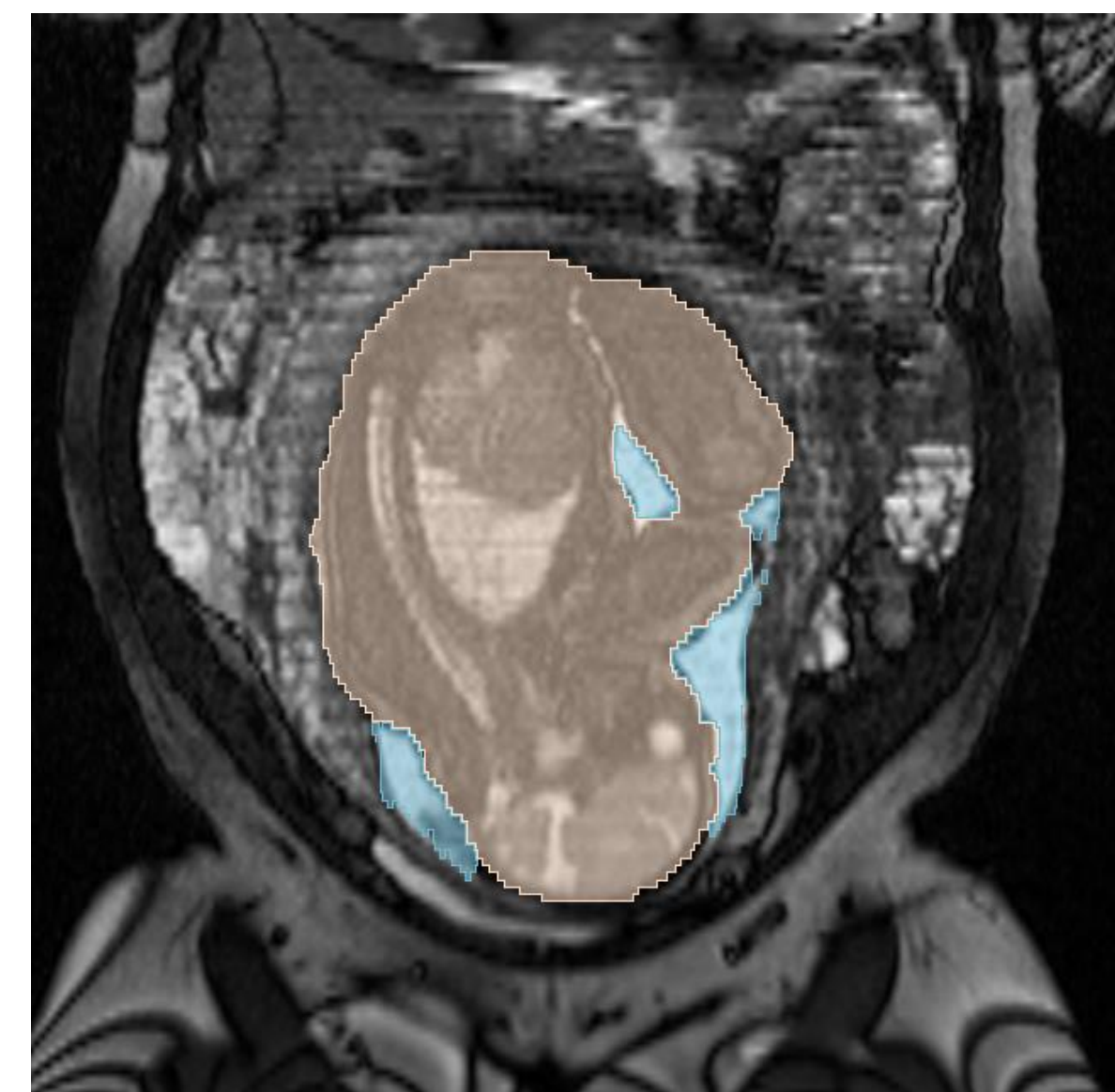


Aims

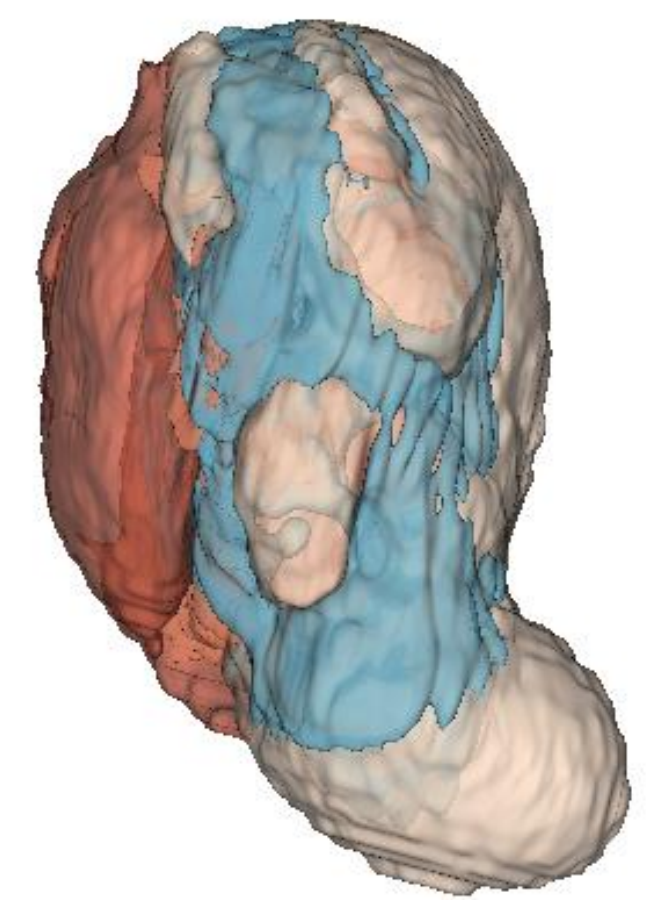
1. To calculate an **MRI-derived amniotic fluid volume** (MR-AFV)
2. To calculate **fetal lung, stomach, kidney and bladder volumes**
3. To **compare ultrasound amniotic fluid index** (US-AFI) with MRI amniotic fluid volume (MR-AFV)
4. To **correlate MR-AFV with fetal organ volumes**

Background

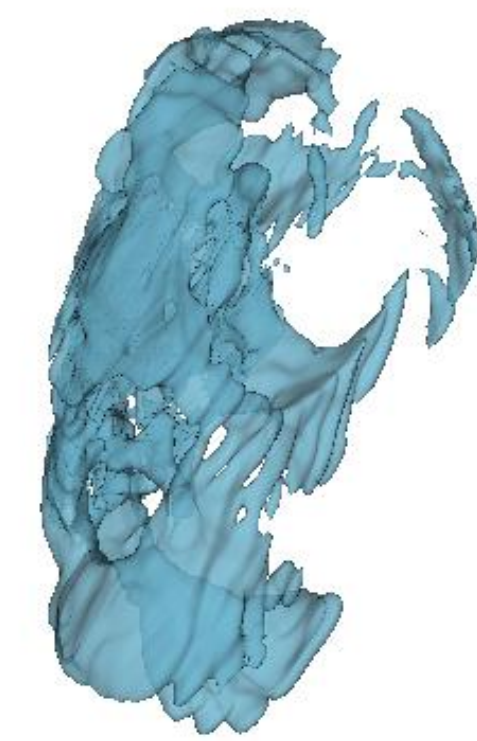
- US-AFI is a 2D measure of a 3D parameter
- MRI provides volume measurements from reconstructed 3D models of amniotic fluid and fetal body organs



MRI reconstruction



3D model fetus, amniotic fluid and placenta

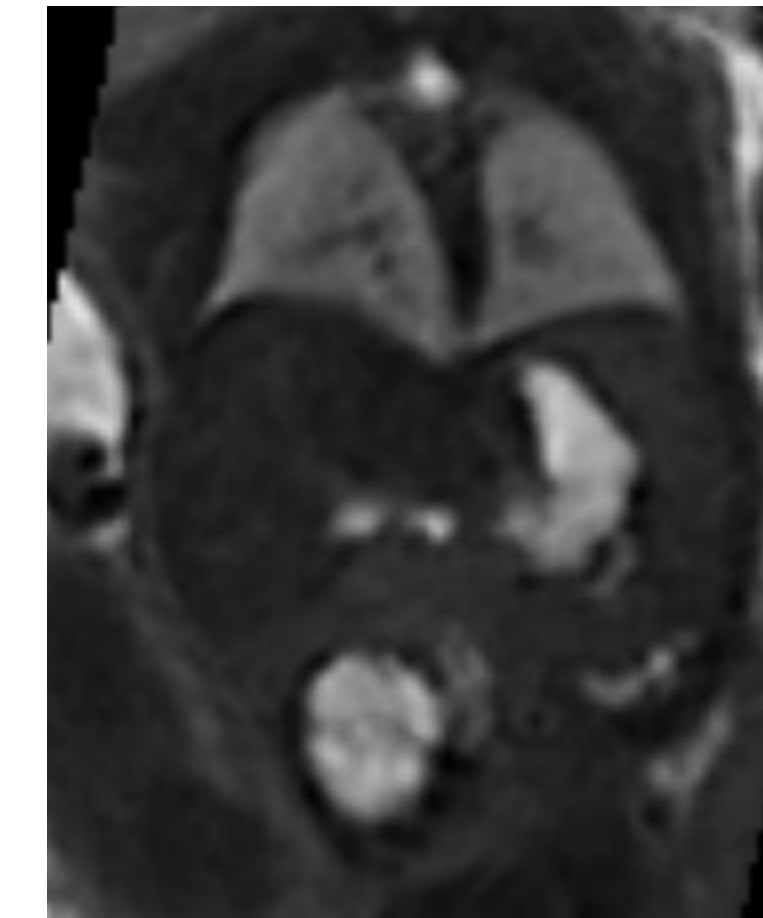


3D model amniotic fluid

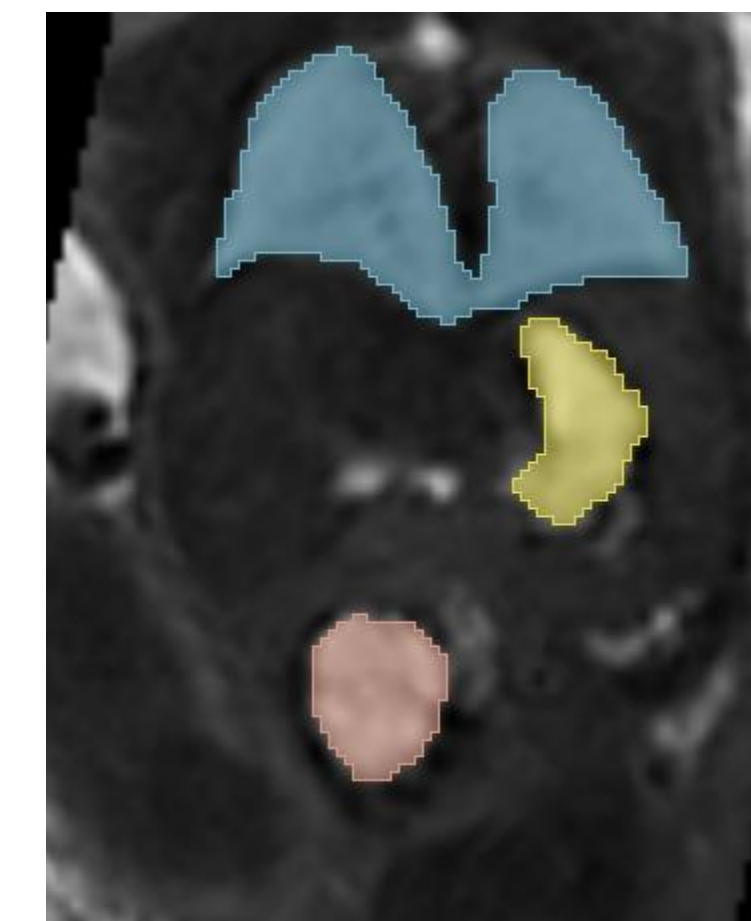
- Amniotic fluid in the stomach and bladder are not accounted for in current estimates
- A total amniotic fluid volume can be estimated by including fetal stomach and bladder volumes to the amniotic fluid volume

Method

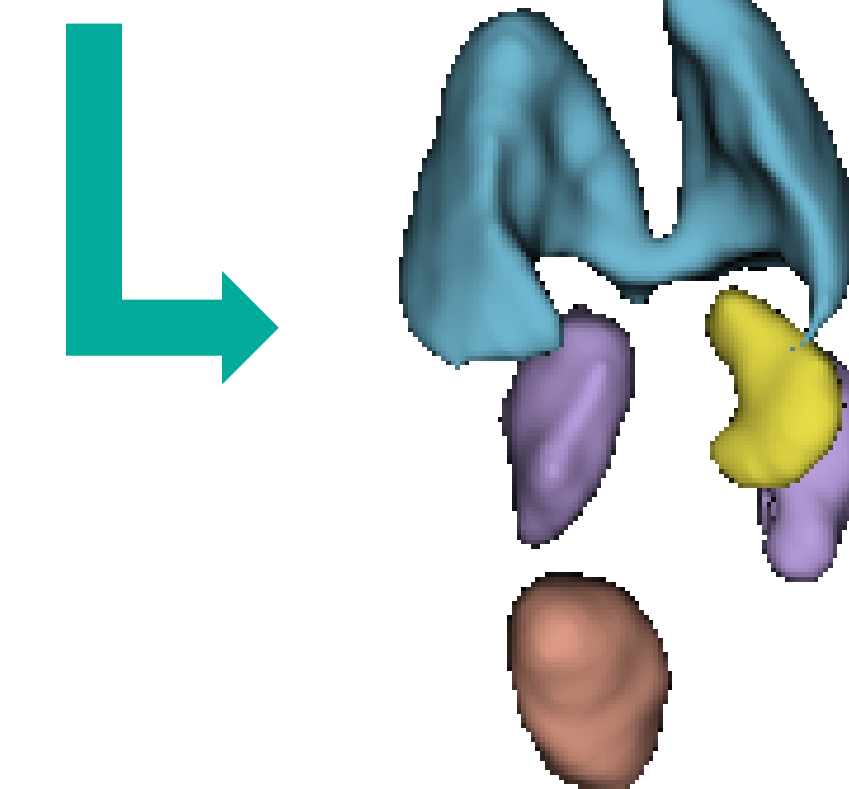
- Pregnant women at 35-41w gestation planning vaginal birth had an MRI for the MiBirth study (**n=129**)
- MRI was performed on a low field (0.55T) Freemax scanner



T2-weighted ssFSE sequences were reconstructed



In-house networks were trained to automatically segment amniotic fluid, fetal body, lungs, stomach, kidneys and bladder



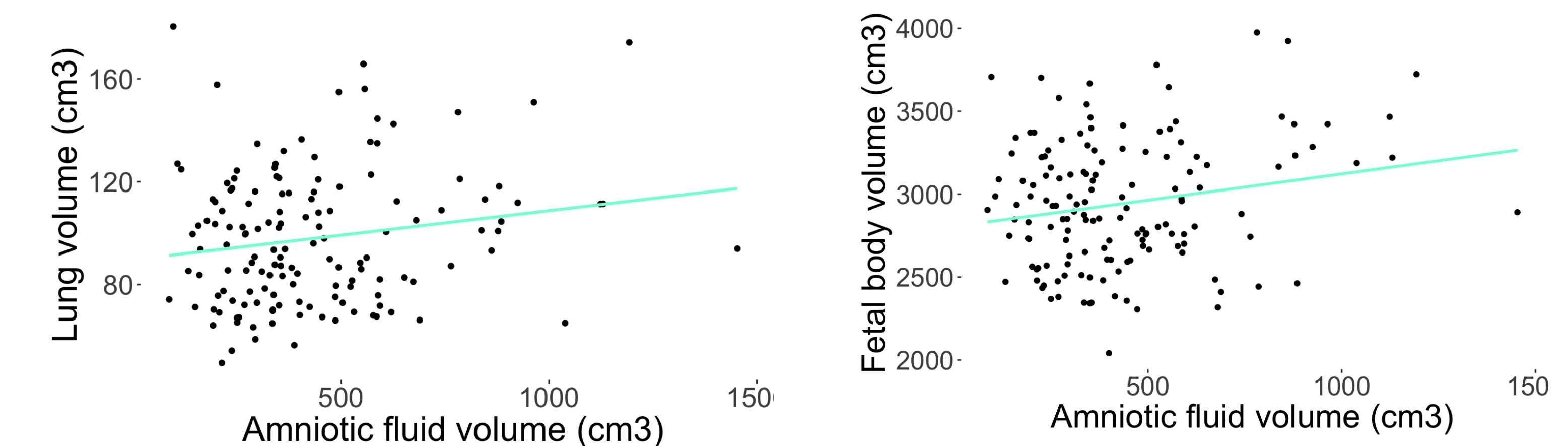
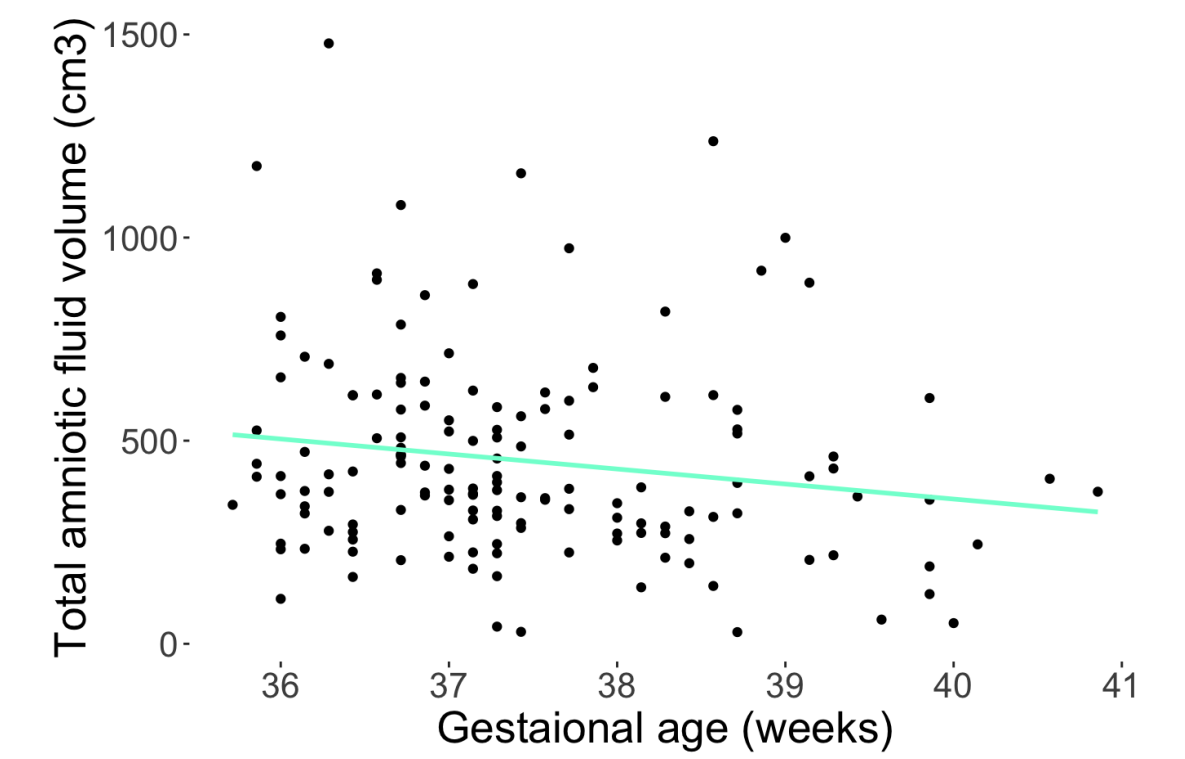
3D models were generated from segmentation and volumes were estimated

$$\text{Total amniotic fluid volume} = \text{amniotic fluid volume} + \text{fetal stomach volume} + \text{fetal bladder volume}$$

- Longitudinal plane US-AFI was calculated within 48 hours
- MR-AFV was correlated with GA, US-AFI and organ volumes using Spearman's correlation and linear regression models in 'R'

Results

- **MR-AFV is correlated with US AFI** ($r=0.43$, $p<0.001$)
- MR-AFV tended to decrease with GA; this approached significance ($p=0.08$)
- **Total amniotic fluid volume, including stomach and bladder volumes, decreased with GA** ($r=-0.19$, $p=0.02$)
- **MR-AFV increased with fetal lung** ($p=0.03$) and **fetal body** ($p=0.02$) **volumes**



- All women ($n=2$) diagnosed with oligohydramnios (US-AFI <5th centile) had MR-AFV <5th centile
- Of the 6 women diagnosed with polyhydramnios (US-AFI >95th centile), 33.3% had MR-ABV >95th centile

Conclusions

- Stomach and bladder volumes can be added to MR-AFV to give a potentially more complete estimate of total fetal amniotic fluid
- Total amniotic fluid volume decreases with GA
- Total amniotic fluid volume has the potential to more accurately diagnose oligohydramnios/polyhydramnios, preventing unnecessary intervention

