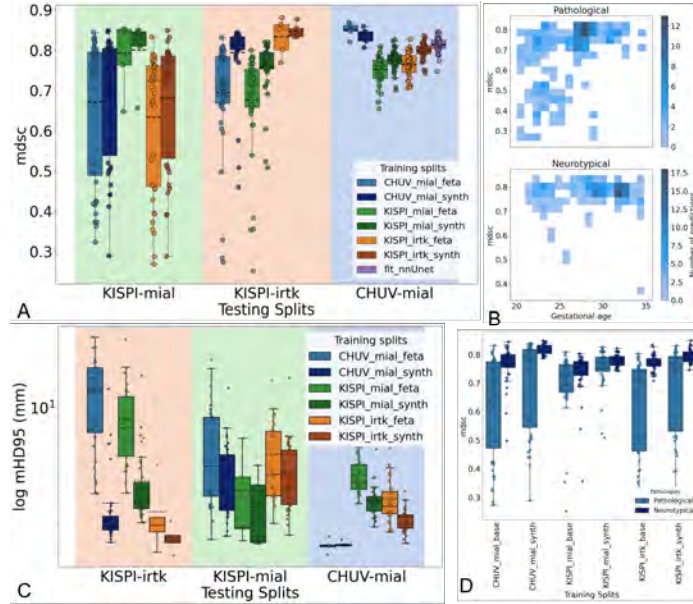## Supplementary material

Fig. S1. Detailed segmentation evaluation. **(A)** Comparison between models including in-domain evaluation on the 5 validation cases. **(B)** Aggregated performance across all models stratified by GA of subjects. **(C)** Boxplot presenting mean 95th-percentile Hausdorff-Distance scores across all tissues for our experiments on a log scale. **(D)** Per-model mean dice score results of models evaluated on `KISPI-mial` split with the distinction between pathological and neurotypical cases.

Table S1. Hyperparameters of the synthetic generator and augmentations. Only parameters deviating from the default ones used by the fully randomized generative model without any tissue priors [3] are reported. Intensities are in $[0, 255]$ range, rotations in degrees and spatial parameters in mm.

Synthetic Data Generator Hyperparameters						
a_{sc}	0.9	a_{tr}	-10	r_{HR}	0.5	
b_{sc}	1.1	b_{tr}	10	b_{res}	0.5	
Augmentations Hyperparameters$_{\mathrm{-Probability}}$						
$\gamma_{\mathrm{range}-0.5}$	$0.5-1.5$	$\mathrm{scale}_{\mathrm{range}-0.5}$	$-0.1-0.1$	$\sigma_{\mathrm{noise}-0.5}$	0.1	$\mu_{\mathrm{noise}-0.5}$ 0
$\mathrm{rotation}_{\mathrm{range}-0.5}$	$-0.2-0.2$	$\mathrm{shear}_{\mathrm{range}-0.5}$	$-0.1-0.1$	$\sigma_{\mathrm{smooth}-0.7}$	$0.5-1.5$	

Table S2. Dice scores and their standard deviation for segmented tissues across splits for the evaluated models. The best-performing model among the baseline, SynthSeg and FetalSynthSeg is highlighted in bold.

Split	Exp*	CSF	GM	WM	LV	SGM	BS	Mean DSC
KISPI-irtk	Bsl	$63.8_{\pm19.1}$	$59.1_{\pm14.6}$	$83.2_{\pm9.6}$	$67.6_{\pm12.8}$	$67.5_{\pm15.4}$	$65.6_{\pm17.8}$	$68.7_{\pm13.2}$
	SS	$71.5_{\pm10.6}$	$59.2_{\pm10.2}$	$81.5_{\pm12.1}$	$66.8_{\pm8.0}$	$67.7_{\pm13.6}$	$72.0_{\pm8.8}$	$71.4_{\pm8.4}$
	FSS	$\mathbf{76.7_{\pm10.7}}$	$\mathbf{69.7_{\pm10.7}}$	$\mathbf{86.4_{\pm10.9}}$	$\mathbf{77.8_{\pm5.8}}$	$\mathbf{71.5_{\pm13.5}}$	$\mathbf{74.9_{\pm8.5}}$	$\mathbf{77.6_{\pm7.9}}$
KISPI-mial	Bsl	$59.7_{\pm29.8}$	$\mathbf{54.9_{\pm15.9}}$	$79.1_{\pm12.6}$	$72.9_{\pm13.8}$	$68.0_{\pm16.6}$	$57.4_{\pm20.6}$	$65.3_{\pm17.3}$
	SS	$57.5_{\pm27.6}$	$48.9_{\pm16.1}$	$75.2_{\pm15.5}$	$72.9_{\pm14.2}$	$69.4_{\pm16.1}$	$59.4_{\pm16.7}$	$64.0_{\pm16.0}$
	FSS	$\mathbf{62.0_{\pm28.0}}$	$54.5_{\pm17.7}$	$\mathbf{79.8_{\pm14.8}}$	$\mathbf{79.5_{\pm12.2}}$	$\mathbf{71.3_{\pm16.9}}$	$\mathbf{63.1_{\pm15.9}}$	$\mathbf{68.9_{\pm15.3}}$
CHUV-mial	Bsl	$74.3_{\pm7.4}$	$64.1_{\pm5.7}$	$84.3_{\pm3.5}$	$74.5_{\pm8.2}$	$78.3_{\pm5.5}$	$70.7_{\pm5.9}$	$75.9_{\pm3.4}$
	SS	$74.6_{\pm6.0}$	$56.2_{\pm12.0}$	$81.9_{\pm4.6}$	$72.1_{\pm8.0}$	$80.9_{\pm5.5}$	$76.6_{\pm4.8}$	$75.4_{\pm4.6}$
	FSS	$\mathbf{78.8_{\pm3.5}}$	$\mathbf{64.9_{\pm6.6}}$	$\mathbf{85.0_{\pm3.3}}$	$\mathbf{77.9_{\pm5.3}}$	$\mathbf{80.6_{\pm5.8}}$	$\mathbf{76.4_{\pm5.6}}$	$\mathbf{78.8_{\pm2.6}}$
	fit	$84.1_{\pm2.5}$	$71.2_{\pm3.9}$	$88.1_{\pm2.4}$	$82.4_{\pm4.6}$	$85.7_{\pm4.1}$	$68.4_{\pm\,4.1}$	$81.3_{\pm1.9}$

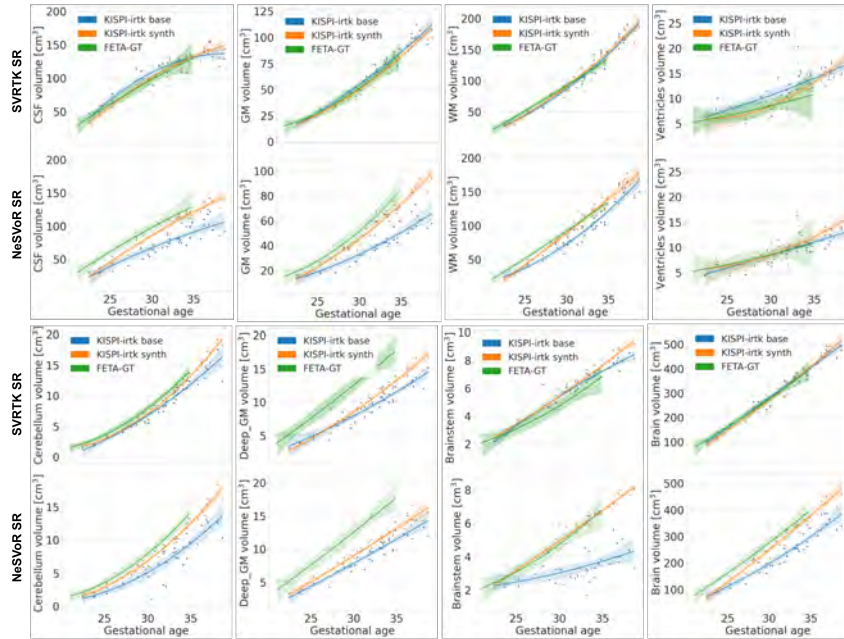*Bsl=Baseline, SS=SynthSeg, FSS=FetalSynthSeg (ours), fit=fit_nnUnet

Fig. S2. Segmented tissue volumes vs GA for KCL data for all tissues.