

Table S1 Characteristics of extremely preterm participants according to completeness of follow-up growth assessment ^a

| | Completers: 4 assessments (n=109) | Non-completers <4 assessments (n=178) | p |
|---|--|---|----------|
| Infant perinatal factors | | | |
| Birthweight (grams), mean [SD] | 747.1 [127.4] (n=109) | 742.4 [103.6] (n=178) | 0.737 |
| Multiple births | 33.9 (37/109) | 22.0 (39/177) | 0.027 |
| Male sex, % (n) | 45.0 (49/109) | 51.1 (91/178) | 0.310 |
| Gestational age 24 weeks or less, % (n) | 59.6 (65/109) | 58.4 (104/178) | 0.840 |
| White ethnicity, % (n) | 81.7 (90/109) | 76.4 (136/178) | 0.295 |
| Scores of 3 or 4 on first chest radiograph, % (n) | 33.0 (36/109) | 29.9 (53/177) | 0.584 |
| First temperature <35, % (n) | 18.4 (19/103) | 26.9 (46/171) | 0.111 |
| Enteral feeding begun by day 7, % (n) | 58.5 (62/106) | 48.0 (83/173) | 0.088 |
| Definite or probable diagnosis of NEC, % (n) | 1.8 (2/109) | 2.8 (5/177) | 0.599 |
| Moderate/Severe brain injury during neonatal period, % (n) ^b | 16.5 (18/109) | 25.4 (45/177) | 0.077 |
| More than 8 weeks of steroids for CLD, % (n) | 5.5 (6/109) | 6.4 (11/173) | 0.769 |
| Measured at 2.5-year follow up | | | |
| Parent in non-manual employment, % (n) | 47.6 (50/105) | 20.4 (33/162) | 0.000 |
| Severe motor disability, % (n) | 1.8 (2/109) | 13.5 (23/170) | 0.001 |
| Feeding problems at 2.5y, % (n) | 29.6 (32/108) | 35.3 (60/170) | 0.328 |
| Given infant food supplements, % (n) | 5.5 (6/109) | 4.1 (7/170) | 0.592 |

^a According to the availability of height data at four time points from age 2.5 to 19 years; results for weight, BMI and head circumference were similar.

^b Parenchymal pathology and/or ventriculomegaly on worst cranial ultrasound scan before discharge home. NEC: necrotising enterocolitis; CLD: chronic lung disease.

Table S2 Complete case analysis: estimated mean differences and 95% confidence intervals in z-scores for growth parameters from multilevel modelling analyses in extremely preterm (EP) participants and term-born controls ^a

| (a) | | | | |
|---------------------------------|---|---|---|---|
| Parameter | Height z-score | Weight z-score | BMI z-score | Head circumference z-score |
| | Unadjusted ^b (n=163) Estimate (95% CI) | Unadjusted ^b (n=167) Estimate (95% CI) | Unadjusted ^b (n=162) Estimate (95% CI) | Unadjusted ^b (n=163) Estimate (95% CI) |
| EP (ref.=controls) ^c | -0.74 (-1.02, -0.46) | -0.90 (-1.26, -0.54) | -0.65 (-1.00, -0.30) | -1.30 (-1.63, -0.97) |
| Age at assessment ^d | -0.01 (-0.01, 0.00) | 0.06 (0.04, 0.07) | 0.07 (0.06, 0.08) | 0.04 (0.03, 0.05) |
| (b) | | | | |
| | Adjusted for sex ^e (n=163) Estimate (95% CI) | Adjusted for sex ^e (n=167) Estimate (95% CI) | Adjusted for sex ^e (n=162) Estimate (95% CI) | Adjusted for sex ^e (n=163) Estimate (95% CI) |
| EP (ref.=controls) ^c | -0.73 (-1.02, -0.45) | -0.90 (-1.26, -0.53) | -0.65 (-1.00, -0.30) | -1.30 (-1.63, -0.96) |
| Age at assessment ^d | -0.01 (-0.01, 0.00) | 0.06 (0.04, 0.07) | 0.07 (0.06, 0.08) | 0.04 (0.03, 0.05) |
| Male (ref.=female) | -0.08 (-0.35, 0.18) | -0.05 (-0.39, 0.29) | -0.02 (-0.34, 0.31) | -0.04 (-0.35, 0.28) |

^a Completed cases included EP participants who completed all four assessments and controls who completed all three assessments. For all models, age was centred at 6 years to make intercept coefficients more meaningful.

^b Variables in the model: group status (EP participants or controls), age at assessment and the group*age interaction. Interactions were not shown if insignificant.

^c Estimates represent mean differences in growth measure z-scores between EP participants and controls.

^d Estimates represent estimated average changes in growth measure z-scores over time: for instance, on average, weight increase by 0.06 SD per year.

^e Sex was further adjusted for to examine whether it would affect growth trajectories in the two groups. The group*sex interactions were insignificant (not shown), which indicates similar trajectories between females and males in both groups.

Table S3 Complete case analysis: factors associated with growth trajectories within EP participants (multi-level modelling) ^a

| Variables | Height z-score | Weight z-score | BMI z-score | Head circumference z-score |
|--|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| | Adjusted ^b (n=104) | Adjusted ^b (n=109) | Adjusted ^b (n=104) | Adjusted ^b (n=105) |
| | Estimate (95% CI) ^c | Estimate (95% CI) ^c | Estimate (95% CI) ^c | Estimate (95% CI) ^c |
| Gestational age (per week) | - | - | - | 0.32(0.03, 0.62) |
| Birthweight z-score (per SD) | 0.27 (0.06, 0.48) | 0.26 (-0.01, 0.53) | 0.12 (-0.14, 0.38) | 0.41(0.15, 0.68) |
| Birthweight z-score*Age ^c | - | -0.02 (-0.04, -0.00) | -0.02 (-0.04, 0.00) | - |
| White ethnicity | -0.71 (-1.20, -0.22) | -0.34 (-0.89, 0.20) | - | - |
| Ethnicity*Age ^c | 0.04 (0.01, 0.06) | 0.06 (0.02, 0.10) | - | - |
| Enteral feeding begun before day 7 | 0.29 (-0.09, 0.67) | 0.44 (0.04, 0.85) | 0.43 (0.04, 0.82) | 0.34(-0.07, 0.75) |
| Enteral feeding *Age ^c | -0.02 (-0.04, -0.00) | - | - | - |
| Steroids for chronic lung disease (per week) | - | - | - | -0.05(-0.12, 0.03) |

^a Completed cases included EP participants who completed all four assessments and controls who completed all three assessments. For all models, age was centred at 6 years to make intercept coefficients more meaningful. For continuous variables (e.g., birthweight z-score), estimate refer to estimated change in growth measure z-scores for per unit change in the predictor. For categorical variables, it refers to estimated difference in means relative to the reference group.

^b Adjusted for age and variables with a p value <0.05 in the unadjusted models.

^c Interactions with age at assessment were shown if significant. Significant interactions indicate that the impact of the predictor on the growth outcomes differed with age at assessment.

Table S4 Pubertal stage at 11 years in children born extremely preterm and controls

| | | Extremely preterm (N=219) | Controls (N=132) | <i>p</i> |
|---------------------------------|---------------|------------------------------|------------------|----------|
| Puberty | % (n/N) | 29.6 (47/159) | 24.8 (32/129) | 0.369 |
| | Boys % (n/N) | 14.9 (10/67) | 14.6 (8/55) | 0.953 |
| | Girls % (n/N) | 40.2 (37/92) | 32.4 (24/74) | 0.301 |
| Boys | | N=69 | N=58 | |
| Voice deepened | % (n/N) | 6.7 (4/ 60) | 13.6 (6/ 44) | 0.234 |
| Axillary hair present | % (n/N) | 10.4 (7/ 67) | 12.7 (7/ 55) | 0.694 |
| Physical development (stage) | | | | |
| | 1 % (n/N) | 33.8 (23/68) | 31.5 (17/54) | 0.777 |
| | 2 % (n/N) | 54.4 (37/68) | 55.6 (30/54) | |
| | 3 % (n/N) | 10.3 (7/68) | 13.0 (7/54) | |
| | 4 % (n/N) | 1.5 (1/68) | 0.0 (0/54) | |
| Pubic hair (stage) | | | | |
| | 1 % (n/N) | 56.5 (39/69) | 41.1 (23/56) | 0.177 |
| | 2 % (n/N) | 34.8 (24/69) | 53.6 (30/56) | |
| | 3 % (n/N) | 7.2 (5/69) | 5.4 (3/56) | |
| | 4 % (n/N) | 1.4 (1/69) | 0.0 (0/56) | |
| Girls | | N=93 | N=74 | |
| Menstruation commenced | % (n/N) | 9.7 (9/93) | 6.8 (5/74) | 0.499 |
| Axillary hair present | % (n/N) | 40.0 (32/80) | 27.6 (16/58) | 0.131 |
| Breast development (stage) | | | | |
| | 1 % (n/N) | 34.4 (32/93) | 29.7 (22/74) | 0.984 |
| | 2 % (n/N) | 29.0 (27/93) | 37.8 (28/74) | |
| | 3 % (n/N) | 23.7 (22/93) | 21.6 (16/74) | |
| | 4 % (n/N) | 7.5 (7/93) | 8.1 (6/74) | |
| | 5 % (n/N) | 1.1 (1/93) | 0.0 (0/74) | |
| Pubic hair (stage) | | | | |
| | 1 % (n/N) | 41.9 (39/93) | 55.4 (41/74) | 0.045 |
| | 2 % (n/N) | 30.1 (28/93) | 28.4 (21/74) | |
| | 3 % (n/N) | 17.2 (16/93) | 10.8 (8/74) | |
| | 4 % (n/N) | 9.7 (9/93) | 5.4 (4/74) | |

Table S5 Multilevel modelling: pubertal status at 11 years and z-scores for growth parameters from adolescence to adulthood ^a

| Parameter | Height z-score n=67 | | Weight z-score n=67 | | BMI z-score n=67 | | Head circumference z-score n=67 | |
|---|------------------------|----------|------------------------|----------|----------------------|----------|------------------------------------|----------|
| | Estimate (95% CI) | <i>p</i> | Estimate (95% CI) | <i>p</i> | Estimate (95% CI) | <i>p</i> | Estimate (95% CI) | <i>p</i> |
| EP males | | | | | | | | |
| Age | -0.03 (-0.06, -0.01) | 0.017 | 0.03 (-0.01, 0.07) | 0.121 | 0.07 (0.02, 0.11) | 0.003 | 0.06 (0.03, 0.08) | <0.001 |
| Puberty at 11 years (ref.=pre-puberty) ^b | 0.30 (-0.33, 0.93) | 0.346 | 0.13 (-0.84, 1.10) | 0.792 | -0.13 (-1.18, 0.92) | 0.810 | 0.09 (-0.46, 0.64) | 0.745 |
| Age*Puberty ^c | -0.12 (-0.20, -0.05) | 0.002 | -0.15 (-0.27, -0.03) | 0.011 | -0.10 (-0.23, 0.03) | 0.146 | -0.02 (-0.09, 0.05) | 0.571 |
| EP females | | | | | | | | |
| Age | 0.00 (-0.03, 0.03) | 0.815 | 0.07 (0.03, 0.10) | <0.001 | 0.09 (0.05, 0.13) | <0.001 | 0.01 (-0.03, 0.06) | 0.553 |
| Puberty at 11 years (ref.=pre-puberty) ^b | 0.84 (0.44, 1.24) | <0.001 | 1.02 (0.56, 1.48) | <0.001 | 0.85 (0.36, 1.34) | 0.001 | 0.18 (-0.39, 0.75) | 0.540 |
| Age*Puberty ^c | -0.12 (-0.17, -0.06) | <0.001 | -0.12 (-0.17, -0.06) | <0.001 | -0.07 (-0.13, -0.01) | 0.016 | 0.00 (-0.08, 0.07) | 0.945 |
| Control males | | | | | | | | |
| Age | -0.02 (-0.07, 0.03) | 0.369 | 0.02 (-0.02, 0.05) | 0.325 | 0.03 (-0.01, 0.06) | 0.137 | 0.05 (-0.01, 0.10) | 0.120 |
| Puberty at 11 years (ref.=pre-puberty) ^b | 0.06 (-0.73, 0.86) | 0.876 | 0.20 (-0.77, 1.17) | 0.684 | 0.14 (-0.80, 1.08) | 0.767 | -0.36 (-1.17, 0.45) | 0.386 |
| Age*Puberty ^c | -0.03 (-0.13, 0.08) | 0.611 | 0.03 (-0.04, 0.10) | 0.402 | -0.01 (-0.09, 0.08) | 0.890 | -0.09 (-0.21, 0.04) | 0.167 |
| Control females | | | | | | | | |
| Age | 0.01 (-0.02, 0.04) | 0.450 | 0.06 (0.02, 0.10) | 0.002 | 0.08 (0.04, 0.12) | <0.001 | 0.07 (0.03, 0.11) | 0.001 |
| Puberty at 11 years (ref.=pre-puberty) ^b | 0.90 (0.49, 1.30) | <0.001 | 1.13 (0.63, 1.63) | <0.001 | 1.02 (0.47, 1.57) | <0.001 | 0.61 (0.17, 1.05) | 0.007 |
| Age*Puberty ^c | -0.07 (-0.13, -0.02) | 0.012 | 0.00 (-0.07, 0.07) | 0.935 | 0.01 (-0.07, 0.08) | 0.901 | -0.06 (-0.13, 0.01) | 0.118 |

^a Age centred at 11 years; boys and girls analysed separately due to the significant interaction between sex and puberty status at 11 years.

^b Estimates represent estimated differences in mean growth measure z-scores between participants who entered puberty at 11 years and those who did not.

^c Significant age*puberty interactions indicates the relationship between pubertal at 11 years and growth measure z-scores differed with age.

Table S6 Relationships of head circumference z score with cognitive/attainment scores at each age for EP participants and controls

| Age | Outcomes ¹ | Head circumference z-score | | | | | |
|---------------------------------------|-----------------------|-----------------------------------|--------|----------------------------------|--------------|----------------------------------|--------------|
| | | Unadjusted B (95%CI) ⁰ | P | Adjusted B (95%CI) ^{0*} | P | Adjusted B (95%CI) ⁰⁺ | P |
| Extremely Preterm participants | | | | | | | |
| 2.5y | BSID2 | 2.61 (1.25, 3.97) | <0.001 | 2.64 (1.32, 3.96) | <0.001 | 1.98 (0.66, 3.31) | 0.003 |
| 6y | KABC | 4.58 (2.80, 6.37) | <0.001 | 4.28 (2.68, 5.88) | 0.014 | 3.55 (1.95, 5.14) | <0.001 |
| 11y | KABC | 6.07 (4.35, 7.79) | <0.001 | 5.57 (3.90, 7.24) | <0.001 | 4.00 (2.39, 5.61) | <0.001 |
| | Reading | 7.47 (5.53, 9.42) | <0.001 | 6.92 (4.99, 8.85) | <0.001 | 5.62 (3.61, 7.62) | <0.001 |
| | Mathematics | 6.78 (4.71, 8.85) | <0.001 | 6.31 (4.23, 8.39) | <0.001 | 5.67 (3.43, 7.91) | <0.001 |
| 19y | WASI-II | 3.63 (1.51, 5.75) | <0.001 | 3.86 (1.76, 5.96) | <0.001 | 2.73 (0.62, 4.83) | 0.012 |
| Control participants | | | | | | | |
| 6y | KABC | 1.02 (-0.77, 2.82) | 0.263 | 1.02 (-0.79, 2.82) | 0.268 | 1.02 (-0.79, 2.82) | 0.268 |
| 11y | KABC | 1.32 (-0.46, 3.10) | 0.145 | 1.31 (-0.48, 3.10) | 0.151 | 1.31 (-0.48, 3.10) | 0.151 |
| 19y | WASI-II | 0.68 (-1.72, 3.08) | 0.572 | 0.79 (-1.63, 3.21) | 0.516 | 0.79 (-1.63, 3.21) | 0.516 |

¹ Developmental outcome at 2.5 years assessed using the Mental Development Index (MDI) of the Bayley Scales of Infant and Toddler Development 2nd Edition (BSID-II). IQ at age 6 and 11 years measured using the Mental Processing Composite (MPC) of the Kaufman Assessment Battery for Children (KABC); academic attainment at 11 years measured using the Wechsler Individual Achievement Test 2nd Edition (WIAT-II) for reading and maths, and IQ at 19 years using the Full Scale IQ of the Wechsler Abbreviated Scale of Intelligence - Second Edition (WASI-II).

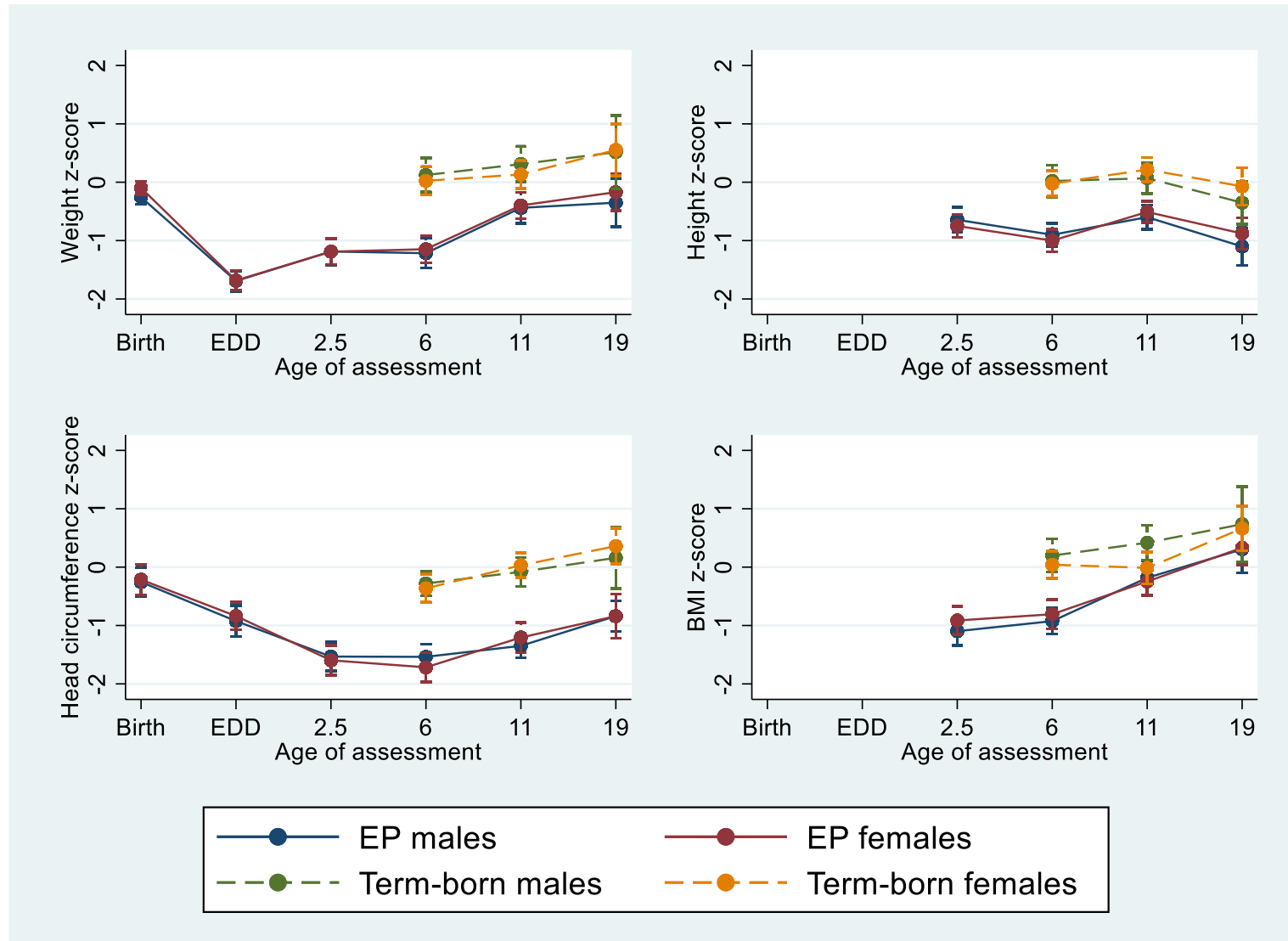
⁰ Change in cognitive score per SD change in head circumference.

* EP group adjusted for neonatal brain injury, sex and gestational age; control group adjusted for sex.

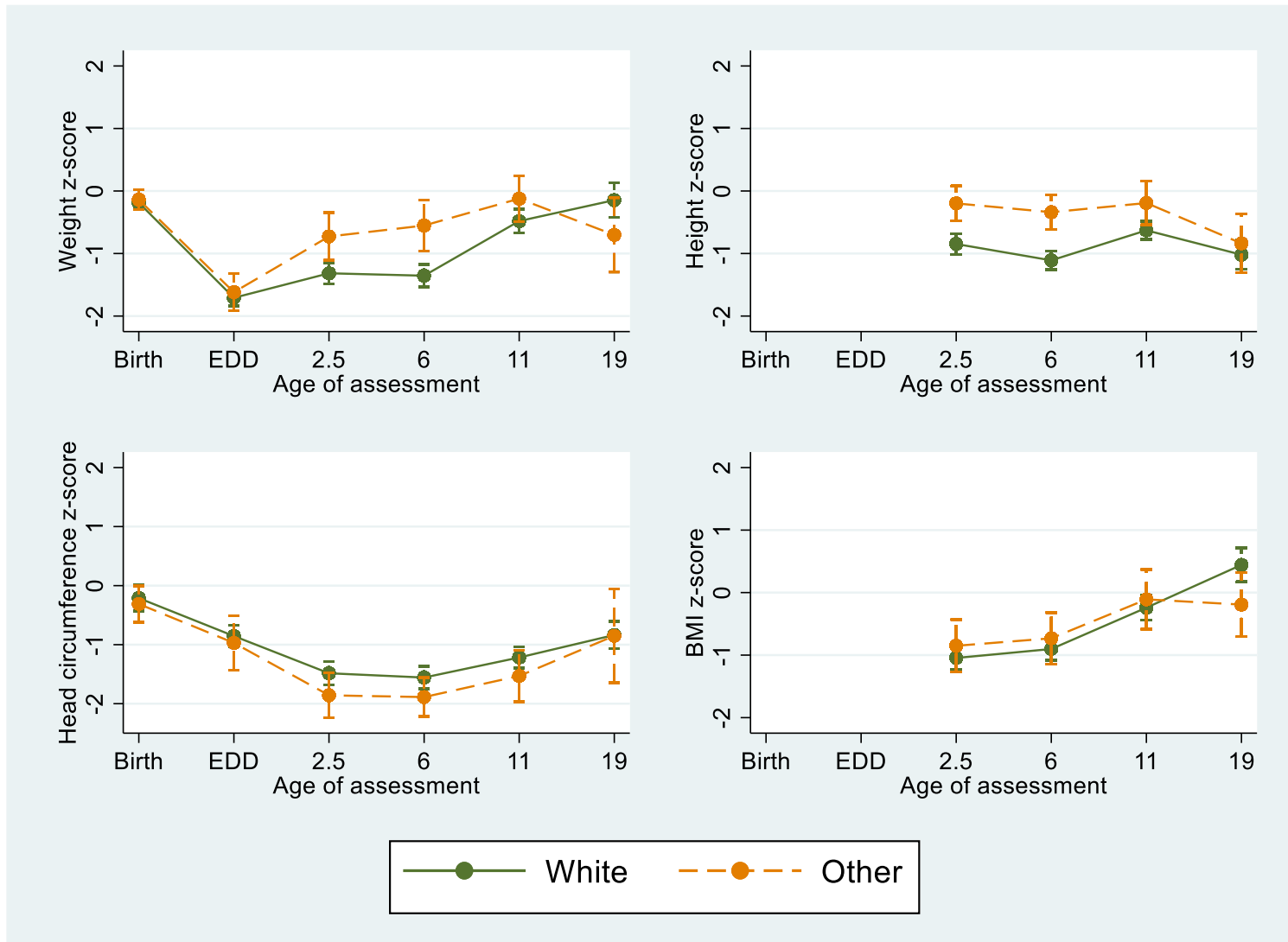
+ Excluding those with severe motor disability.

Figure S1 Observed means plus 95% confidence intervals of z-scores for growth parameters in EP participants and term-born controls at different ages.

(a) Extremely preterm and controls by sex (observed)



(b) Extremely preterm by ethnicity (observed)



(c) Extremely preterm by enteral feeding by day 7 (observed)

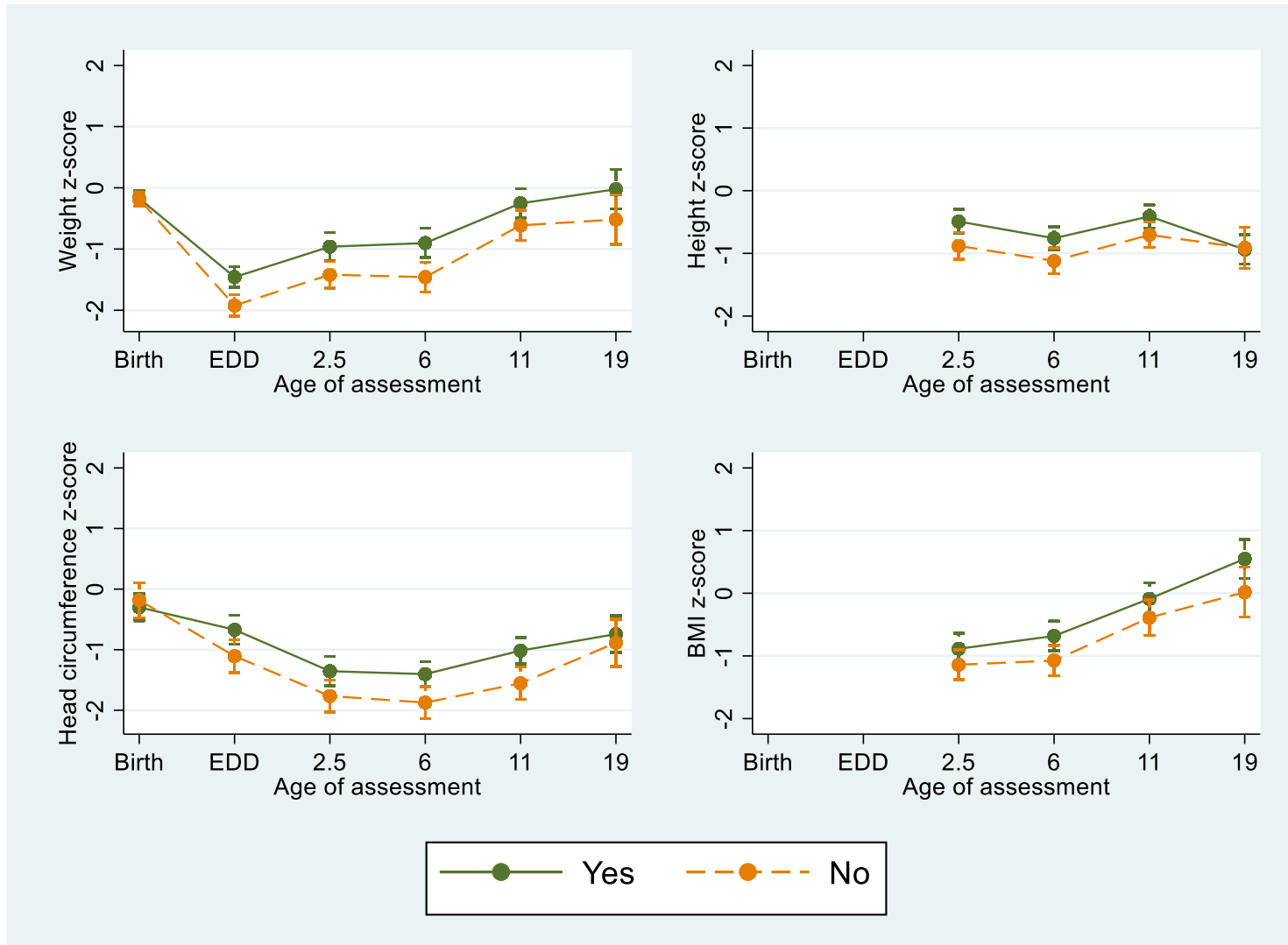
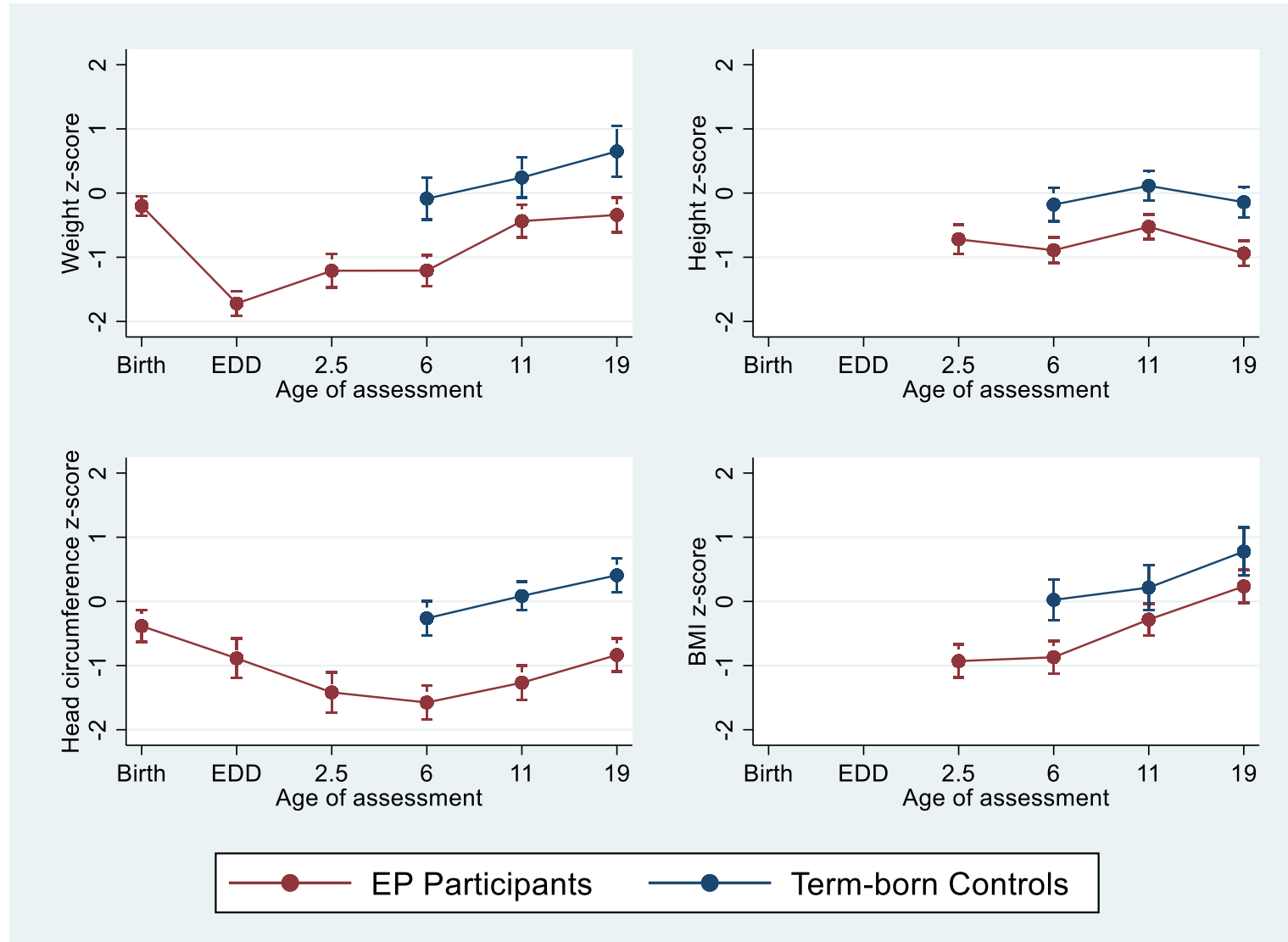


Figure S2 Observed means plus 95% confidence intervals for growth measure z-scores in EP and control participants at different ages (complete data)[†]



[†] EDD refers to expected date of delivery. Height and BMI z-scores not available at birth and EDD.